9410

Bibl. Jag.

9410
II

1 Walther König Greifswald Domstr. 10 Oberlehrer

$700 \cdot 10^{-10} \frac{F.D.}{sec}$

R. Mehmke Stuttg. C. Runge Hannover

Fortschritte L I 3464 (T)

Wien Ann. 2702 (T)

~~4893~~ U

Crelle-Borchardt 81 Oberbeck: motion of ellips. through infinite viscous liquid

Electronentheorie in Metallen: Drude Ann. I p. 566

Patterson Phil Mag. ~~IV~~ III, p 655

Rotating machine!

Prandtl d. station. [illegible] Phys Z. 5 p 599-601 (1904)

Wood Quantit. d. e Dispersion d. Na [illegible] Ph. Z. 5 p 605-606 (1904); Nature 70 p 516 (1904)

Humphreys The Effect of Pressure on Light from El. Arc Phys. Review 19 p 300 (1904)

Oberbeck ~~Drude~~ Wieden 39 p 555 (1890) [illegible] discont.

Drude 27 p 695 Millikan

Chemical News 90, p 139 1904 || Ph Mag 34, 51 (1902)

Jeans: Kinematik u Kinetik einer Strömung (körniger) von normaler Häufung

Pr. M. S. (2, 3 Part 2 124-157 (1905)

Kritisches Lösungsgebiet, Opalescenz etc.   Kuenen Zustandsgl. p. 55

Rothmund Z. ph. Ch. 26 p. 446 (1898)

Friedländer " 38 p. 385 (1901)

Konowalow 1884 Journ Russ Chem Ges. 16 p. 11 | Drude Ann. 10 p. 360 | 12 p. 1160 (1903)

Guthrie Phil Mag 18 p 30, 504 (1884)

Ostwald Wied Ann 63 p 336 (1897)

Donnan Chem News 90 p. 139 (1904)

Lehfeldt Ph. M. 50 p 284 (1900)

Child & Loeb Potentialgradient

Einfluss von Druck auf innere Reibung

Röntgen Wied Ann 22 p. 510 (1884)

Warburg & Sachs " " 518 "

Cohen 45 666 (1892)

Tammann 69 771 (1899) (Wasser & Lösungen)

Hauser Drude Ann. 1900 p. 1253

Kelvin Nature 50 p. 524, 549, 573, 597, (1894)

[illegible] (1849) [illegible] Stokes [illegible]

[illegible]

[illegible]

[illegible]

Petrini Soc. R. Scien. Upsala (1894) Beibl. 1895 p. 385

[illegible]

[illegible]

[illegible]

[illegible]

W. Wien [illegible] Ann. 1894 p. 509

M. Réthy [illegible] Math. u. Nat. Ber. a. Ungarn 12 p. 144 (1895)

[illegible] Kirchhoff Beibl. 1895 p. 679

Reynolds Beibl. 1894 p. 506 [illegible]

Drude Wied. Ann. 11 p. 222 (1903) [illegible]

Traube [illegible] ph. Ch. p. 251

1). [illegible]

[illegible]

2). Phenol – ~~[illegible]~~ H_2O [illegible]

[illegible]

Trimethylamin – H_2O [illegible]

Kuenen Phil. Mag. 6 p. 637 (1903)

S. Thompson Sichtbares u. Unsichtbares Licht p. 139

wärmeempfindliche gelbe Farbe: wird bei 45° roth

[illegible] $AgNO_3$ [illegible] KJ [illegible] $[AgJ]$ [illegible]

[illegible] concent. [illegible] HgChlorid [illegible]

[illegible]

[illegible] Gummi arabicum

= roth, bei 87° schwarz

KJ [illegible] $CuSO_4$ [illegible]; [illegible] conc. [illegible] $HgCl$

Verbrennungswärmen Zusammenstellung:

Stohmann Z ph. Ch. 10 p. 410 (1892) Vaubel II p. 376

Naumann Lehr- u. Handbuch d. Thermochemie (1882)

Curie Mme Chem News 86 p. 61 1902 On the atomic weight of Radium

[illegible] Radium

[illegible] Cl [illegible] $RaCl_2$ [illegible] $AgCl$ [illegible] $\frac{1}{20}$ [illegible]

$RaCl_2$ [illegible] Demarçay spectralen [illegible] Ba

225.3, 225.8, 225.0 (Ag = 107.8, Cl = 35.4 [illegible])

225 [illegible]

[illegible] Ba [illegible] Th [illegible] U [illegible]

Sur le poids atomique du radium CR. 135 p. 161-163 (1902)

Curie P. et Mme S. Curie Sur les corps radioactifs CR 134 p. 85-88 (1902)

Radioact. — [illegible] Atoms [illegible] const. Energiequelle [illegible]

? [illegible] potent. [illegible] Atoms [illegible] ?

[illegible] (secundär) [illegible] Carnot [illegible]

[illegible] Energie (Strahl.) [illegible]

R Cohen

Terpentinöl Dichte (18°) 0·866

Änderung d Viscosität für 7°: 100·6 % für 600 atm

15°: 97·5 % "

T': 7°	1 atm	5737·5	
15°		5022·5	
7°	100	6623	15·4 %
"	300	8636·5	50·5 %
15°	300	7439	48·10
7°	600	11508·5	100·6
15°	600	9918·	97·5

Nall Lösung 25·7 %

			300 atm	600
t = 20	1 atm	9286		9676·5 4·2
14·5		6357·28	6508 2·37	6644 4·5
22·5		5174		5412 4·59

13·8 %

14·5° 1 atm 4160·5 | 300 : 4191·38 0·74 | 600 4230·33 1·68

8 %		600		4 %		
20	5077·17	4991·5	−1·69	2°	600	−2·69 %
14·5	3639·5	3655	+0·42			
22·5	3028·75	3050·67	+0·69			

H_2O: Tammann ~~Wied. Ann. 69 p. 771 (1899)~~

Zeitsch. ph. Ch. 28 p. 17 (1899) (überhitztes Eis)

Centnerszwer [illegible] 29 p. 235 Zph. Ch. 49 p. 198 (1904)

Ye & Corlett Methan [illegible]

[illegible]

[illegible]:

	K. T.	K D
Methylchlorid	143.0	0.370
$(C_2H_5)_2O$	194.4	0.258
CH_3OH	240.2	0.275

Wilson Über die Convection der [illegible] Camb. Proc. 12 p. 406 (1904)

[illegible]

Boussinesq [illegible]

C.R. 138 p. 1134, 1189, (1904

Duhem C.R. 134 (1902) [illegible] p. 265, 456, 580, 686, 1088)

~~[illegible]~~ – incompr. [illegible]

compr. [illegible] (P T ρ) [illegible] $\frac{d\rho}{dt}$ [illegible]!

Krystallinische Struktur der Metalle:

Kalischer Physik. Zeitschr. 4 p. 854

Holborn & Henning Sitzgsber. Berl. 1902 p. 936

Radioaktivität von Quellen

A Schmidt Physik. Zeits. 6 p 34 / ... Tannusquellen
Himstedt Ann. Ph. 3 (1904)
Curie & Laborde C. R. 138 p. 1150 (1904)
Elster & Geitel Phys. Z. 5 p 321 (1904)
6 p 67 (1905) Nauheim, Baden-Baden,
Herman & Pesendorfer Ph. Z. 6 p 70 (1905) Karlsbad

Lorenz : Wärmeleitung in rotierenden Kanälen Ph. Z. 6 p 82 (1905)

Tilden Chem News 1904 sprawozd. Chem Polsk. 1904 p 315
Ciepło właśc. metali oraz wielkie różnice ciepł. właśc. a wagami atomowymi
Ciepło prawo Neumanna pozostaje ważne przy uwzględnieniu zmienności ciepła właśc. pierwiastków z temperaturą
Oznaczono c dla Sn, Ag, Ni, Te, Al i potasowane od −180° do +500°
Okazało się zupełne zgodność np. NiTe

Tabs.	$c_{at\,Ni} + c_{at\,Te}$	$c_{mol\,NiTe}$
100°	9·20	8·38
200°	11·08	11·35
300°	12·22	12·41
400	13·00	12·92
500	13·49	13·15
600°	13·85	13·28
700°	14·11	13·35

Travers Chem News 1904   Chem. C. 1904 p 309

skraplanie helu ... ; 6 ... (20^0). Otrzymanie jako ... H_2

N_2 acetooctan etylu ... -150° krystal.

... natychmiast ... szkliste

H_2: 14.1° ciśn. 49-50 mm tedy się ... krystal.

Rozdzielanie gazów za pomocą centryfugi   Chem. C.   p 333

Bredig 1895 H_2 | HJ
zupełne rozdzielenie

Bredig & Hober, Mazzo etc.

Dewar Ann. chim. phys. 1904   chwytanie gazów ... przez węgiel z drzew ...

1 cm^3 węgla z orzecha kokosowego pochłania

	w temp. 0	-185°C	ciepło wydziel. przez gr.
H_2	4 cm^3	135	9.3 cal
		155	25.5
N_2	15	230	34
O_2	18	175	25
A	12	15	2
He	2	190	27.5
CO_2	21		

Nature 71 p. 559 (1905)

Rayleigh Dynamical Th. of Gases : diffic. of explaining $\frac{c}{c}$ by appealing to the ether

Jeans p. 607 : admits infinite number of parts of energy in a space with reflecting walls, but maintains equilibrium, to want ∞ time

Rayleigh 72 p. 54 calculates number of parts corresponding to given λ comparison with Plancks radiation-formula, exceedingly interesting conn^d with former paper. Phil Mag. 49 p 539 (1900)

Beibl. 29 p. 371

Lobry de Bruyn & Wolff [illegible] Tyndall [illegible] [illegible] continuity [illegible] [illegible]

Buchbury On the variation of Entropy as treated in W. Gibbs ~~Statistical~~ Stat. Mech. Phil Mag. 6, 251–259 (1903).

Z Ph Ch. 46, 197– 1903

Donnan the theory of capillarity & colloidal solutions

~~[illegible]~~ attempts to demonstrate the possibility of negative surface tension between two phases. This must not follow total miscibility but [illegible] [illegible] it would tend to ~~[illegible]~~ [illegible] minute grains [illegible] critical dimension are formed of 2 one liquid [illegible]

(range of molecular forces) | colloid sol. |

[illegible] v d Waals Z Ph Ch 13, [illegible]

A priori possible: colloid. sol. of the same nature as crystalloid. sol. [illegible]

[illegible]

[illegible] 2). [illegible]

[illegible] of

[illegible]

[illegible]

---

p. 11 [illegible]

[illegible]

[illegible]

[illegible]

[illegible] ZPh. Ch. 46 p. 119–150 [illegible]

[illegible]

[illegible] Fraction [illegible]

[illegible] : 50 [illegible]

[illegible] 4 – 15 [illegible]

[illegible]

[illegible] > 30000

[illegible] < 3000 [illegible]

[illegible]

3: ✓ [illegible]

[illegible]

[illegible]

[illegible]

✓ [illegible]

[illegible] ; KCl [illegible]

[illegible]

Polemik [illegible]

[illegible] Z.D.G. 47. 336-366 (1893) [illegible]

[illegible]

[illegible] 51 129-160 1905 [illegible]

Teisserenc de Bort C. R. 140 p. 467 Nat. Rdsch. 20 p. 213 (1905)

von cca 11 km an Temp. Abnahme fast ~~[illegible]~~ nicht vorhanden, nie ganz unregelmässig, neutrale Zone

[illegible]

Jeans Phil. M. 8 692 (1904)

kinetic theory leads:

$\mu = 0{\cdot}350\ \rho \bar{c} \lambda = 0{\cdot}0001714$ $\qquad \lambda = \dfrac{1{\cdot}255}{\sqrt{2}\,.\,\pi N \sigma^2}$ $\quad \therefore \quad N\sigma^2 = 3306\ \text{cm}^2$

$\frac{2\pi}{3} N\sigma^3 = b = \begin{cases} 0{\cdot}00198 \text{ (V. d. W.)} \\ 0{\cdot}00209 \text{ (Rontgen?)} \end{cases}$

$N = \dfrac{(N\sigma^2)^3}{(N\sigma^3)^2} = 4{\cdot}92\,.\,10^{19}$ double errors of b, treble of μ

N from ionic charge $= 4{\cdot}0\,.\,10^{19}$ Thomson $= 3{\cdot}4$, Wilson $3{\cdot}1$ $.10^{-10}$ (est.), Townsend $3{\cdot}0$

from $N\sigma^2$ and N resp. $\sigma = 2{\cdot}86\,.\,10^{-8}$ cm

in the same way we can ~~get~~ deduce σ by combining N with conduction of heat $K = 1{\cdot}6027\ \mu c_v$

selfdiffusion $D = 1{\cdot}34 \frac{\mu}{\rho}$

Thus we get:

	H_2	He	H_2O	CO	C_2H_2	N_2	air	nitric ox. NO	O_2	A	CO_2	nitrous N_2O	CH_3Cl	Cl_2
μ	2·65	1·81	3·39	2·90	3·77	2·90	2·86	2·82	2·81	2·79	3·47	3·57	4·68	4·11
K	1·99			2·74	3·88	2·74	2·72	2·81	2·58		3·58	3·48		
D	2·63			2·92					2·71		3·27			
b	2·05					3·12	2·90				3·00			
Mean	2·63	1·81	3·39	2·86	3·81	2·91	2·84	2·82	[illegible]	[illegible]	[illegible]	3·52	4·68	4·11

Sampson On Stokes's Current Function Trans. R. S. 182 (1892)

line-sink line source

extended doublet r ∴ cur. f. for it: $\psi = -2mr$ (1)

Superposition gives finite line source

Generally in any case of symmetry about axis any irrot. motion can be produced by such ...

$$\psi = \int_{-\infty}^{\infty} f(\xi)\sqrt{\varpi^2+(z-\xi)^2}\,d\xi \qquad (2)$$

$$\underbrace{\frac{\partial^2\psi}{\partial\varpi^2}+\frac{\partial^2\psi}{\partial z^2}-\frac{1}{\varpi}\frac{\partial\psi}{\partial\varpi}}_{D\psi}=0 \qquad (3)$$

For rotational motion: $D\psi = -2\omega\varpi$ (3a)

Analogy between r in (1, 2) and $\frac{1}{r}$ in usual potential

Follows expansion of $\sqrt{1-2\mu x+x^2}$ etc. analogous to usual harmonics:

solution of (3):

$\psi = (Ar^n + Br^{-n+1})\{C\, I_n(\cos\theta) + D\, H_n(\cos\theta)\}$

Analogous expansion ~~..~~ appropriate to spheroid and ~~..~~ tore

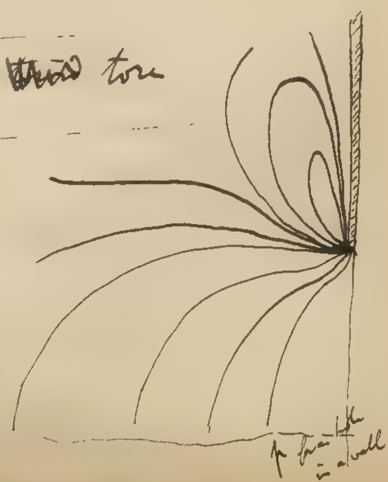
Applications: Instantaneous motion:

1). Fixed Spherical obstacle

2) Spheroidal obstacle

3). within Hyperboloid

4). Obstacle a tore



Rotational motion by friction :

$$\mathfrak{D}\,\mathfrak{D}\psi = 0$$

$$\therefore \begin{cases} \mathfrak{D}\psi = V \\ \mathfrak{D}V = 0 \end{cases}$$

resulting pressure = $16 V\mu a$

1), Obstacle a sphere 2). Spheroid (Disc) 3) hyperboloid

$$\frac{\varpi^2}{\lambda - 1} + \frac{z^2}{\lambda} = h^2$$

$$z = h\mu\rho$$

$$\varpi = ih\sqrt{(1-\mu^2)(1-\rho^2)}$$

equation $D\psi = 0$ transforms into :

$$(1-\mu^2)\frac{\partial^2\psi}{\partial\mu^2} - (1-\rho^2)\frac{\partial^2\psi}{\partial\rho^2} = 0$$

solution :

$$\sum \mathcal{I}_n(\rho)\left[A_n \mathcal{I}_n(\rho) + B_n H_n(\rho)\right]$$

$$\cancel{\psi = \mathfrak{D}_1\rho + \mathfrak{B}_3 \mathcal{I}_3\rho}$$

$$\psi = \frac{\mathfrak{B}_3}{2}\rho(\rho^2 - 3\rho_0^2)$$

$$\mathfrak{B}_3 = -\frac{2Vh^2}{3(1-\rho_0^2)}$$

relations :

$$u = -\frac{V}{1-\rho_0^2}\frac{(\rho^2-\rho_0^2)\mu}{(\mu^2-\rho^2)i}\sqrt{\frac{1-\rho^2}{1-\mu^2}}$$

$$w = \frac{V}{1-\rho_0^2}\frac{\rho^2-\rho_0^2}{\mu^2-\rho^2}\rho$$

$\therefore$ stream surfaces : hyperboloids confocal with the boundary

flat wall with circular hole :

$$u = -V\frac{\mu\rho^2\sqrt{1-\rho^2}}{i(\mu^2-\rho^2)\sqrt{1-\mu^2}}$$

$$\psi = -\frac{Vh^2\rho^3}{3}$$

$$w = V\frac{\rho^3}{\mu^2-\rho^2}$$

both of which vanish at the edge

for any hyperboloid

$$\psi = \frac{2Vh^2}{3(1-\rho_0^2)}(\rho^3 - 3\rho\rho_0^2)$$

V = velocity at the centre

mean pressure $\displaystyle p = \frac{4\mu V}{ih(1-\rho_0^2)}\left[\operatorname{tg}^{-1}\bar{\mu} + \frac{\bar{\mu}}{\bar{\mu}^2+\bar{\rho}^2}\right]$

difference of pressures at infinity :

$$\Pi = \frac{4\mu V\pi}{ih(1-\rho_0^2)}$$

Total flux through the aperture $\displaystyle F = \frac{V\pi h^2}{3(1-\rho_0^2)}(\rho_0^2-1)^2(2\rho_0+1)$

a = radius of ap. = $ih\sqrt{1-\rho_0^2}$

$$= \frac{a^3}{12\mu}\frac{(2\rho_0^2+1)(1-\rho_0)^{\frac{1}{2}}}{(1+\rho_0)^{3/2}}\Pi$$

for plane wall : $\displaystyle F = \frac{a^3}{12\mu}\Pi$

Phil Mag. 50 (1900)

Rayleigh Theorem analogous to Virial Th.

Allen on the motion of a sphere in a viscous fluid p. 323, 519

[Knibbs Proc R. S. NSW. 31 p. 314-355 (1897). about turbulent flow]

Burbury Law of partition of energy

48 (1900)

Thomson Masses of Ions in Gases at Low Pressures p. 547

46 (1898)

Thomson On the Theory of the Conduction of Electr. through Gases by Charged Ions p. 253

Lehfeldt On Properties of Liquid Mixtures (II Partially Miscible Liquids) p. 284

Rayleigh Transmission of Light through ... small particles .. and blue of Sky p. 375

6

Kuenen Mutual Solubility of Liquids p. 637

Burbury p. 251, 529, 720,

Ph. M. 6 Jeans Vibrations set up in Molecules by Collisions p. 279-286 (1903)

Verh. D. Ph. G. 5 p. 60-66 (1903) [illegible] v/ temp. Siebe

Bi		+100	+18	−79	−186°
	$k =$	0·0161	198	252	558
$\frac{\text{[illegible]}}{\text{el.}}$	$\frac{k}{\kappa}\cdot 10^{-1} =$	258	227	211	226

cf. Lorenz' [illegible] ealc. temper.

Konowaloff 10, 11, 12

Study

Verh. D. Ph. G. Fortschr. 1903 p. 9 : [illegible] physik. Darstellungen!

Duhem Recherches IV [illegible] Paris 1903 p. 173

CR 149, 456 (1902)

Ph Z. 4 p 543 Anm. Dewar'sche Mantel-Vacuumgefäße: Die besten 2 l Gefäße lassen in 24 St. cca 140 gr fl. Luft verdampfen (Glasbläser Burger Berlin N) :. pro 24h cca 200° Temp differenz: 7000 cal. Eisfüllung × 9,6 ~ ½ [illegible]

Haldamand CR 136, 299–301, 545 (1903)

[illegible]

Emden Fortschr 1903 p 230, Arch. [illegible] p 7 (1904)

[illegible] : $\lambda = 2\, d \sqrt{p - p_u}$ $z = 1{\cdot}01$, $p_u = 181$

Quincke Z Electrochemie 9, 884, 1903, Fortschr 1903 p 338

[illegible] CS_2 u $(C_2H_5)_2O$ – Tropfen [illegible]

[illegible]

vergl. Fortschr 1896 (2) 432

12 p. 558

[illegible] 4/6 [illegible]

[illegible]

[illegible]

[illegible]

[illegible] $10^{\,[illegible]}$

[illegible] 0.1 [illegible]

[illegible] 0.12 [illegible]

4380 [illegible]

12600 [illegible]

[illegible]

[illegible] Pb + [illegible] V + [illegible] [illegible], [illegible], [illegible] Ti, [illegible] Zr

[illegible] p. 581 [illegible]

[illegible]

[illegible] Ph. Z. 4 p. 136 (1902) [illegible]

[illegible]

[illegible] Ann. 10 p. 581 (1903) [illegible]

[illegible] p. 448 (5) 1901 Physikalische Eigenschaften von Silberspiegeln

[illegible]

[illegible] 8 p. 1[illegible]

[illegible]

[illegible] 13 p. [illegible] p. [illegible] CuO [illegible]

[illegible] 12 p. 5[illegible]

1) [illegible]

[illegible] 43 p. 2[illegible]

2) [illegible]

4) [illegible]

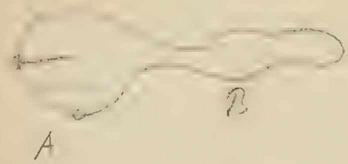
[illegible] N. [illegible]

[illegible]

[illegible] (1896)

[illegible]

[illegible] [illegible] 52 p. 433 ([illegible])

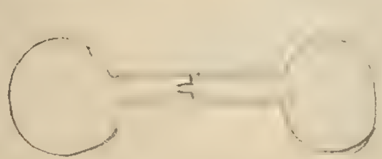


[illegible]

Rb [illegible]

K, Na [illegible]

[illegible] 57 p. 23



[illegible] K [illegible]

Seite 46 p. 284

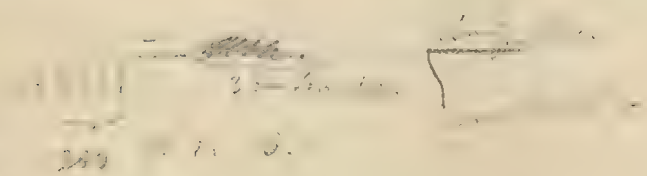
[illegible] K, Na, K [illegible]

[illegible]

16 p. 181 [illegible]

[illegible]

[illegible]



[illegible]

40 p. [illegible]

[illegible]

p. 244 [illegible]

21 p.622 [illegible]

15 p 910

Gött Nachr 1905 p. 282

" Sommerfeld

CR 140 p 65-70 (1905)

Hutton u. Mord

[illegible]

Brownian motion p. 49?

[illegible]

[illegible] alteration of [illegible], independently of currents.

[illegible] light [illegible]

[illegible]

[illegible] no [illegible] properly [illegible]

Exner: only light & heat, glycerine [illegible] generally any medium, but clearly in 50°

1). Brownian heightened by light & heat [illegible]

2). [illegible] lighter [illegible] do not sink to the bottom, but [illegible] the level of particles & speed not equally through the fluid

3). the velocity of these oscillations is as the intensity of the [illegible] movement influenced by light & heat.

F. Schultze: [illegible] remain suspended in pure water and other fluids for days, weeks & months

p. 83. [illegible]

because nearly [illegible]

himself: electric currents sent through: no effect

Effect of gravity apparent with ~~cinnabar~~ but not for cochineal

Cochineal [illegible] any other also to Gamboge [illegible]

because of [illegible]

the more [illegible] the smaller the particles, [illegible] no effect of [illegible]

No influence of magnetic field except iron

p. 96: The motion by currents caused by heat can be differentiated from Brownian mov. and by gravity

[illegible] of heat [illegible] light [illegible]

cause of the [illegible]

[illegible] to be explained [illegible]

[illegible] [illegible] [illegible]

Due to [illegible] [illegible] [illegible]

Cannot [illegible] mechanical shocks [illegible] [illegible]

∴ fluid moves them.

In [illegible]

Due to mutual repulsion of molecules of water

Drude Ann I p. 538 [illegible] [illegible]

[illegible] : Pierce Phys. Rev. 2 p 99 [illegible]

F p. 790 Eckardt Rubidium [illegible] 37.80

Vol. [illegible] : 0.0163 [illegible] 0.0139 [illegible]

[illegible]

Riecke [illegible] 66 p 353, 545 [illegible] | [illegible]

Drude Phys Z. I p [illegible]

Drude Ann I p. 566

[illegible] p. 736 [illegible]

[illegible]

[illegible] | [illegible]

[illegible] | [illegible]

[illegible] (1873) p. 78 [illegible]

[illegible] | [illegible]

[illegible], [illegible], 36, 5 [illegible] ($CaCO_3$)

[illegible] [illegible]

but [illegible] more [illegible]

[illegible] effect, [illegible]

closely connected [illegible]

Clay [illegible]

in suspension; [illegible]

on [illegible]

[illegible] of [illegible] the molec. [illegible]

also [illegible] (?)

the [illegible] prevents the [illegible]

the [illegible] of the [illegible]

[illegible] | analogy with [illegible]

[illegible]

except NH_3 [illegible]

[illegible] movement

[illegible]

but [illegible]

does not conduct, but causes [illegible].

$NaSiO_3$ [illegible] movement, [illegible]

[illegible] inverse [illegible] [illegible]

[illegible] p. 66 :

[illegible] [illegible] form

[illegible] [illegible] [illegible] [illegible]

[illegible] : [illegible] [illegible] [illegible]

no electrons : [illegible] [illegible] [illegible] [illegible] [illegible]

perhaps [illegible] of [illegible]

[illegible] [illegible] 5 ; [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] ; 57, [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] p. 28 [illegible] [illegible]

[illegible] [illegible]

C.R. 121 p [illegible]

[illegible]

e

Maltézos Ann. Chim. Ph. 1. (1894) p 559

Gouy : mouv. mol. coordonnés dans les lig. pour espace. 1/μ
mais indép. pour des distances plus grandes

~~nécessaire~~ cette hypothèse impossible

Dunstan[?] : probable que ce soit dû au mouvement calorifique

mais le mouvement calorifique ~~dans~~ les liquides est une hypothèse

donnait l'eau avec de poussière, quelquefois encore de [illegible]
eau bouilli pendant 1 heure, montrait le mouvement

les particules près de la surface mouvement ralenti, viscosité superficielle ?

~~se rassemblement en~~
flocons détruit le mouv., mais des files peuvent le maintenir

~~les~~ sel marin dissous était le centre d'un rayonnement, des courants qui balayaient
le champ de vision ; après ça le fond est tapissé par une multitude de particules
qui ont été poussées là (p 569) mais il y a toujours et en grand nombre qui
~~commencent leur~~ continuent à se mouvoir après la dissolution.

la présence de [illegible] presqu'[illegible] [illegible] partout [illegible]

Jamais est en [illegible] a [illegible] [illegible]

Forces:
excès de poids, forces hydrostatiques, frottement [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] corps [illegible] [illegible]

mais cet équilibre [illegible] cesse [illegible] [illegible] 1). quand [illegible] [illegible]

matière étrangère au corps 2). quand ses pores [illegible] pleins de gaz

3). [illegible] les [illegible] pleins de vapeur [illegible] [illegible] 4). si le liquide [illegible]

du corps est impur.

équilibre
mouvements d'équ. [illegible] pour un corps solide!

[illegible] mouvement [illegible] !

[illegible]

[illegible] [illegible]

[illegible] : [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] celles [illegible] [illegible] [illegible]

[illegible] et immobile. C'est [illegible] [illegible], [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] de [illegible]ables épaisses 0'1 – 0'2 mm, fermés par vernis convenable

pour cette [illegible]

certains [illegible] [illegible] peuvent [illegible] [illegible] : [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] de la propriété des [illegible] qui se déposent

nécessité
[illegible] [illegible] [illegible] [illegible] corps [illegible] [illegible] [illegible]

les corps qui [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible].

[illegible]

[illegible]

aussi [illegible]

Le point le plus important est la régularité [illegible]

Des millions [illegible]

n'a vu [illegible]

[illegible]

[illegible]

1). pour éviter vibrations : sous sol . plan de mercure [illegible]

2). bain d'eau , [illegible]

les courants produisent des mouvements [illegible]

rien [illegible]

3). lumière ? [illegible] la couleur et l'intensité 1 … ; 1000

[illegible]

4). pas [illegible] fait [illegible]

Les [illegible]

[illegible]

[illegible]

interne [illegible] qui les entraîne. [illegible]

[illegible]

vitesses quelques $\frac{\text{[illegible]}}{\text{seconde}}$ [illegible] rend visible

[illegible]

[illegible]

[illegible]

OP [illegible] OQ [illegible]

[illegible] $\alpha =$ [illegible]

[illegible]

$\alpha =$ [illegible] $=$ [illegible]

$a+b$

[illegible] $b > a$

$\frac{b}{a} = 0 \quad [illegible] \quad 1 \quad [illegible] \quad 2 \quad 3 \quad \infty$

$\frac{\alpha}{a} = 0.5$ [illegible]

[illegible] $\frac{\alpha}{b} =$ [illegible]

Averaging over all [illegible]

[illegible]

$= \frac{5k}{\sqrt{2}}$ [illegible] dk

[illegible]

[illegible] and $\int_{k=1}^{\infty}$

[illegible]

$= \cdot 405$

[illegible]

[illegible]

[illegible]

$$\frac{m}{M} = \frac{10^{-10}}{27} \cdot 10^{5} = \frac{10^{-5}}{27}$$

$6^3 = 216$

[illegible] 0·003 m [illegible]

0·000008 [illegible]

[illegible] 22 p. 152 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] nella differente velocità delle molecole [illegible]

temperatura. [illegible]

[illegible]

Cant. R I [illegible] 1 p. 76 [illegible]

[illegible] possa attribuirsi alla differente [illegible]

che [illegible]

[illegible]

differenza [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

pare anzi che [illegible]

[illegible]

[illegible]

[illegible]

pag. 19. [illegible]

[illegible]

[illegible], car [illegible]

[illegible]

[illegible]

20 [illegible]

sel [illegible] 2 [illegible]

[illegible]

[illegible] par

[illegible] (?) [illegible]

[illegible] ~~[illegible]~~ [illegible]

[illegible]

[illegible] C, [illegible]

[illegible]

[illegible] $\delta = 1.0605$ 20°

[illegible]

[illegible]

p. 218 [illegible]

[illegible] microscope : [illegible]

[illegible]

sel : [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

de [illegible] et [illegible] [illegible] [illegible] [illegible], [illegible] [illegible] [illegible] [illegible]

et, [illegible] comme emportée par un torrent

En un mot : l'électrolyse rend l'agglomération des [illegible] [illegible]

sans doute parcequ'il les dépouille de leur dernière couche de liquide, et

leur permet de cette façon d'arriver au contact réel.

—

[illegible] [illegible] [illegible] [illegible] $\xrightarrow{\text{courant}}$ O_2 [illegible], [illegible]

$\leftarrow$ S, [illegible] [illegible] [illegible] [illegible] [illegible]

Électrolyse

Le [illegible] peut-il pas être étranger à la [illegible] des [illegible]

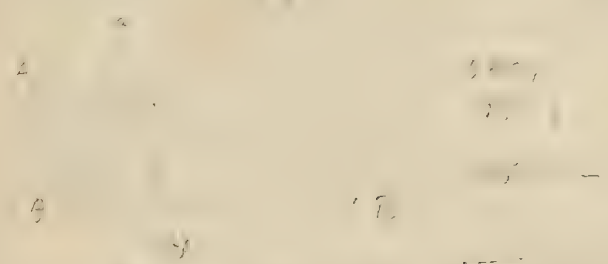
[illegible] de [illegible] p. 256 la [illegible] [illegible] [illegible] [illegible]. [illegible] [illegible]

? d'un corps qu'on [illegible] [illegible] [illegible], = deux plusieurs au lieu d'une seule

[illegible] [illegible] [illegible] [illegible] [illegible]!

[illegible] (T [illegible]) [illegible]

[illegible] q [illegible] p [illegible]



the [illegible] T [illegible]

[illegible] = mean value of [illegible]

drawing [illegible] $\perp$ [illegible] = [illegible]

[illegible] impact, [illegible] impact

[illegible] $= \dfrac{q}{\ldots}$ [illegible]

$$OS = \frac{\sqrt{\ldots}}{p+q}$$

$$\therefore\ p' = Oa = \frac{\sqrt{q^2(\ldots) + \ldots}}{p+q}$$

$$q' = Ob = \frac{\sqrt{p^2(\ldots) + \ldots}}{p+q}$$

$$\therefore\ \ldots - \ldots = \left(\frac{p-q}{p+q}\right)^2 (\ldots - \ldots)$$

$\therefore$ [illegible] $p^2 - q^2$ [illegible]

[illegible] and then [illegible]

[illegible] the mean [illegible] [illegible]

[illegible]

Note:
After impact with given component velocities before impact:

mean velocity$_1^2$ = (velocity of centre of gravity)^2 + (relat. vel.)$_1^2$

[illegible]

[illegible] Dingl. J. 239, 225, [illegible] 12 205, Fortschr. 1881

Rauch [illegible] 100 [illegible]

[illegible] 0·0002 – 0·0003 [illegible]

[illegible] HNO_3 H_2SO_4 HCl. SO_2 [illegible]

[illegible]

0·0006 − 0·[illegible] 0·0[illegible]

0·0023 [illegible]

~~0·0014~~ [illegible]

1882)

[illegible] p. 549

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] $\frac{1}{4}$ [illegible]

T[illegible] 23 p. [illegible]

$J_{2\nu+1}$ = [illegible] $V =$ [illegible] v^2 [illegible]

$V_1 -$ [illegible]

[illegible] $\frac{1}{4}$ [illegible] v_0^2 [illegible] $= \frac{1}{4}$ [illegible]

[illegible] 23 (1887) p. [illegible]

Trans. [illegible] $\frac{8\pi^3 n \cdot M}{\ldots}$ [illegible] V [illegible] $\bar{v}^2 d v_0\, dV$ [illegible] $+$ [illegible] $r^2 dr$

for $n \gg M$ [illegible]

$-\frac{v^5}{3} - \frac{2}{3}$ [illegible] $+ v$ [illegible]

[illegible] Zeitschr. Ch. 1901 45 p. [illegible]

[illegible]

[illegible] KCl [illegible]

[illegible]

[illegible]

In support: [illegible]

opp. to the [illegible]

[illegible]

[illegible] of [illegible]

of [illegible]

[illegible]

[illegible]

Analogy between [illegible]

J. Ch. Chem. Soc. 1901 II 182.

[illegible] in $BaCl_2$ [illegible]

[illegible]

[illegible] Müller [illegible] Chem. 1901, [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] (1, [illegible]) [illegible]

[illegible]

[illegible] 7 [illegible]

[illegible] 13

[illegible] p. 172

[illegible]

[illegible] per. [illegible]

[illegible]

$$D = \frac{R T}{N} \, [illegible]$$

[illegible]

[illegible]

$N = 6 \cdot 10^{23}$ $k = 1{\cdot}35 \cdot 10^{-2}$ [illegible] $= 0{\cdot}001$ mm

[illegible] $= 0{\cdot}8$ Mikron | [illegible] N

[illegible] 1 minute $=$ 6 Mikron | $N = \frac{1}{\lambda_x^2} \, [illegible]$

[illegible]

17 [illegible] (1938)

$q = \frac{[illegible]}{11}$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

III. [illegible] B = [illegible]

$R =$ [illegible]

[illegible]

II. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] $\sim P^2$

[illegible] $= \sqrt{\quad} \sqrt{\frac{RT}{\quad}\,\frac{\quad}{\quad}}$ [illegible]

$dN = k$ [illegible] $e^{-\frac{K}{RT}\,[\text{illegible}]}\,dx$ [illegible]

IV. $dN = A' e^{-\frac{N}{RT}\Phi}\,dx$ $\quad \Phi$ [illegible]

[illegible] Φ [illegible]

[illegible] 149

[illegible]

$t = [illegible]$

$T_{p} = [illegible]$

[illegible] 14 p. 206 [illegible]

[illegible] 1013. [illegible] | [illegible] | 17 [illegible]

[illegible]

$\alpha = 0.00362$

$\vartheta =$ [illegible]

$\eta_0 = 13[illegible] \cdot 10^{-7}$

[illegible] $\cdot 10^{-7}$ | 874 | 0.5723

[illegible] | 1050 | [illegible]

[illegible] | 1203 |

$C = 83$

$\eta_0 = [illegible] \cdot 10^{-7}$

[illegible]

Chem. N_2 :

15	1737 · 10^{-7}		760	
	1901		2125	
			2452	

Schmidt ... A ...

Rayleigh 0'96 rel.

$C = 72{,}2$ $n = 5{,}581$

1'25 ... Ne

ϑ = 15'3 | η = 105 ... 10^{-7}

5 p. 140 Schnitt A

$n = 5{,}715$

14	2703 · 10^{-7}	2708
99 2	2741	
183 7	3221	32..

η_0 = 2 ...

Reinigung von ... PLT ... :
1) Benzin, ... Alk.
2) ...
3) ...
4) H_2O
5) ...

[illegible] 5. p. 103

[illegible]

Luft g_0 = 1733.4   C = 118.4   [illegible] 21 [illegible]

Äthylen 961.3   235.9

CO_2 1387.9   239.7

H_2 . 857.4   71.7

~~[illegible]~~ CH_3Cl 988.6   454.0

4 p. 420 [illegible]

II p. 328 [illegible]

p. 1 [illegible] Strich

p. 120 [illegible]

mit Petroläther thermom. 2 p

Luft : k_{-59} = 0.0000 3678   0.00002393   2645

$k_{-149.5}$ = 0.0000 2446   1175

extrapoliert

∴ k_0 = 0.0000 4577   3186

Temp. coeff. Luft 0.00362
H_2 422
CO_2 352   [illegible] Temp. coeff.

Schuster [illegible] p. 835

[illegible] ! [illegible]

[illegible]

$= \frac{1}{[illegible]} \frac{m\,u^2}{[illegible]}\ 2$

II p. 102 [illegible]

[illegible]

	Luft	H_2
R	1.83	[illegible]

18 p. 847 [illegible]

[illegible] c_p [illegible]

Luft 0.0005 [illegible]

A 0. 38 94

[illegible]

$k = \frac{2.501}{2.[illegible]}$ [illegible]

$c_v\, A = \frac{0.[illegible]}{4.667} = 0.07[illegible]$

[illegible]

Temp [illegible]

$c_v\, A = 0.7[illegible]$

[illegible] $= 0.0[illegible]8$

I	H		II
0.038	0.014		15.054

$f =$ 100.4 3025
81 3019
25.6 [illegible]
[illegible] [illegible]
[illegible] [illegible]
22.8 30235 3770
9.6 30095 37795
5.2 30045 3779
1.8 2810 3518
0.6 2554

Temp. [illegible] $f = $ 0.03 [illegible] | Schluss 281
[illegible] 190
[illegible] 196

A 0.50 260

318

Lu: 70.9 0.01801 2351
56 1803 2380
1805 47.8 1817 2326
42.1 1801 2322
37.7 1775
[illegible] [illegible]
20.6 1716 2344
15.8 1676 2043

120 : 205 = 0.57 [illegible] 50 = [illegible] 0.027
=0.12 [illegible] 0.035

[illegible] 60 $f^{\times 2}$

208

190

1?1

		[illegible]	E
H_2	7.1?	6.37	0.3??
CO_2	0.7??	[illegible]	0.553 [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
C_2[illegible]	0.8??	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
CH_4	[illegible]	[illegible]	[illegible]

$$p = \frac{?}{2} \ldots \left[E_{?} + \frac{?}{?} \ldots \right]$$

Generally:

Sampson p 451 (7a): $$\underbrace{\frac{\partial^2\psi}{\partial\varpi^2}+\frac{\partial^2\psi}{\partial z^2}-\frac{1}{\varpi}\frac{\partial\psi}{\partial\varpi}}_{D\psi\,=} = -2\varpi\omega$$

~~Defn~~

$$\cancel{\frac{\varpi}{\sin\varphi}}\,\nabla^2\frac{\sin\varphi}{\varpi}\psi \qquad \Big\Vert\ \nabla^2=\frac{\partial^2}{\partial\varpi^2}+\frac{\partial^2}{\partial z^2}+\frac{1}{\varpi}\frac{\partial}{\partial\varpi}+\frac{1}{\varpi^2}\frac{\partial^2}{\partial\varphi^2}$$

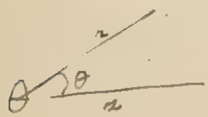
$$\therefore\ \psi=\psi_0+\frac{\varpi}{2\pi\cancel{\sin\varphi}}\iiint\frac{\sin\varphi'\,\omega'\,dx'\,dy'\,dz'}{r}$$

Circulation in any reducible circuit drawn in a meridional plane:

$$-\iint\frac{1}{\varpi}D\psi\,d\varpi\,dz \qquad ----(5)$$

which can be applied for transformation to other coord.

f.ex. polar coord.



velocity $\parallel\theta$: $\Theta=-\frac{1}{r\sin\theta}\frac{\partial\psi}{\partial r}$

$\parallel r$: $R=\frac{1}{r^2\sin\theta}\frac{\partial\psi}{\partial\theta}$

$$D\psi=\frac{\partial^2\psi}{\partial r^2}+\frac{1-\cos^2\theta}{r}\frac{\partial^2\psi}{\partial\cos^2\theta}$$

For potential motions

$D\psi=0$

$\psi=-2mr \qquad ----(1)$

Analogy to ordinary sinks $\left(\psi=-\frac{2m}{r}\right)$

$$\sqrt{r_0^2-2rr_0\cos\theta+r^2}=-\sum_{n=0}^{\infty}\frac{r^n}{r_0^{n-1}}J_n(\cos\theta) \quad\text{or}\quad \sum\frac{r_0^n}{r^{n-1}}J_n(\cos\theta)$$

$$(1-\mu^2)\frac{\partial^2J_n}{\partial\mu^2}+n(n-1)J_n=0 \qquad \mu=\cos\theta$$

Irrot. motion within hyperboloid: $\psi = V h \tilde{\rho}$

Rotational motion

$$\frac{d\xi}{dt} = \nu \nabla^2 \xi \qquad \frac{d\eta}{dt} = \nu \nabla^2 \eta \qquad \frac{d\zeta}{dt} = \nu \Delta^2 \zeta$$

$$D^2\psi = \frac{1}{\nu}\frac{d}{dt} D\psi$$ Stokes' well known equation (Cambridge Phil. Tr. 9 ...)

Steady motion:

$$\left.\begin{array}{l} D\psi = V \\ DV = 0 \end{array}\right\} (3e)\ p. 484$$

~~p. 499~~ p. 477

$z = h\mu\rho$

$\varpi = i h\sqrt{(1-\mu^2)(1-\rho^2)}$

where we shall suppose $|\mu^2| > |\rho^2|$

and by an arbitrary convention ρ to change sign with z

$$\left.\begin{array}{ll} \text{Velocity} \parallel \text{to } \mu: & P = \frac{1}{h\varpi}\sqrt{\frac{1-\rho^2}{\rho^2-\mu^2}}\ \frac{\partial\psi}{\partial\rho} \\ \rho: & Q = -\frac{1}{h\varpi}\sqrt{\frac{1-\mu^2}{\rho^2-\mu^2}}\ \frac{\partial\psi}{\partial\mu} \end{array}\right\} (51)$$

$$D\psi = -\frac{1}{h^2(\rho^2-\mu^2)}\left[(1-\mu^2)\frac{\partial^2\psi}{\partial\mu^2} - (1-\rho^2)\frac{\partial^2\psi}{\partial\rho^2}\right] \quad \text{-- (6a)}$$

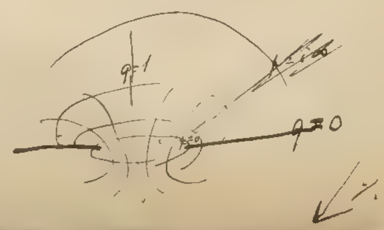
~~μ, ρ are the reciprocals of the eccentricities of the generating curves~~

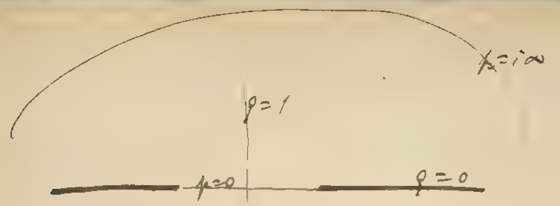
Planetary spheroids and hyperboloids of one sheet: — h^2 = square of radius of focal circle in plane of symmetry

$\frac{\mu}{\rho} = \frac{\sqrt{e^2-1}}{e}$ e = eccentricity of generating el. / hyp.

∴ for planetary spheroid: $\underset{\text{ring of foci}}{0} < \mu < \underset{\text{axis}}{\overset{\text{infinity}}{i\infty}}$

$\underset{\text{plane of symmetry beyond focal circle}}{0} < \rho < 1$





ρ everywhere a pure imaginary

$$R = \sqrt{1 - 2\alpha x + \alpha^2} = -\sum \alpha^n \mathfrak{I}_n(x) \qquad \text{--- (8)}$$

$$\mathfrak{I}_n(x) = \frac{1 \cdot 3 \cdots (2n-3)}{1 \cdot 2 \cdots n}\left[x^n - \frac{n(n-1)}{2(2n-3)}x^{n-2} + \frac{n(n-1)(n-2)(n-3)}{2 \cdot 4\,(2n-3)(2n-5)}x^{n-4} - \right]$$

the series ending with x^1 or x^0

2 Exceptional cases: $\mathfrak{I}_1(x) = x$

$\mathfrak{I}_0(x) = -1$

$$\frac{\partial(\mathfrak{I}_n x)}{\partial x} = P_{n-1}(x) \qquad (18)$$

$$\mathfrak{I}_n = \frac{1}{n-1!}\,\frac{\partial^{n-2}}{\partial x}\left(\frac{x^2-1}{2}\right)^{n-1} \qquad (\text{Heine } \S 7) \quad (12)$$

$$\mathfrak{I}_n(\pm 1) = 0 \qquad (\text{p}(460))$$

etc. $x^2 \mathfrak{I}_n(x) = \delta\, \mathfrak{I}_{n+2} + \varepsilon\, \mathfrak{I}_n + \zeta\, \mathfrak{I}_{n-2}$ (17) $\delta = \frac{(n+1)(n+2)}{(2n+1)(2n-1)}$, $\varepsilon =$, $\zeta =$

$$\mathfrak{I}_n(x) = \frac{1 \cdot 3 \cdots 2n-3}{1 \cdot 2 \cdots n} P_1^{(n-1)}(x)$$

Heine Cap III § 30-33, Cap IV

$$(1-x^2)\frac{\partial^2 \mathfrak{I}_n x}{\partial x^2} + n(n-1)\,\mathfrak{I}_n(x) = 0$$

$$\frac{\partial^2 \mathfrak{I}_n x}{\partial x^2} = -n(n-1)\frac{\mathfrak{I}_n x}{1-x^2} \quad \Big|\ \mathfrak{I}_m x$$

$$\frac{\partial^2 \mathfrak{I}_m x}{\partial x^2} = -m(m-1)\frac{\partial \mathfrak{I}_m x}{1-x^2} \quad \Big|\ \mathfrak{I}_n x$$

$$\left[\mathfrak{I}_m \frac{\partial \mathfrak{I}_n}{\partial x} - \mathfrak{I}_n \frac{\partial \mathfrak{I}_m}{\partial x}\right]_{-1}^{+1} = (m-n)(m+n-1)\int_{-1}^{+1} \frac{\mathfrak{I}_m \mathfrak{I}_n}{1-x^2}\,dx$$

$$\therefore \int_{-1}^{+1} \frac{\mathfrak{I}_m \mathfrak{I}_n}{1-x^2}\,dx = 0 \qquad m \gtrless n$$

$m = n$:

$$\int \frac{\mathfrak{I}_n \mathfrak{I}_n}{1-x^2}\,dx = \frac{1}{2n-1}\left[\frac{\partial \mathfrak{I}_n}{\partial n} P_{n-1}\right]_{-1}^{+1}$$

if n positive integer

$$= \frac{2}{n(n-1)(2n-1)} \qquad (23)$$

If we have $\varphi(x)$ vanishing for $x = \pm 1$ we can find a linear function:

$$\sum_{2}^{\infty} A_n J_n(x) = \varphi(x)$$ for all values between ± 1 (Rayleigh, Sound, ch. 6)

$$A_n = \frac{\displaystyle\int_{-1}^{+1} dx\, \varphi(x)\, \frac{J_n(x)}{1-x^2}}{\displaystyle\int_{-1}^{+1} dx\, \frac{J_n(x)\, J_n(x)}{1-x^2}}$$

When n is positive integer: (25A)

$$x^n = \frac{n!}{1.3\ldots 2n-1}\left[(2n-1)J_n + (2n-5)\frac{2n-1}{2}J_{n-2} + (2n-9)\frac{(2n-1)(2n-3)}{2.4}J_{n-4} + \ldots\right].$$

If: $F(x) = c_0 + c_1 x + c_2 x^2 + \ldots$

$= b_0 J_0 + b_1 J_1 + b_2 J_2 + \ldots$

$$b_n = \frac{n!}{1.3\ldots 2n-3}\left[c_n + \frac{(n+1)(n+2)}{2(2n+1)} c_{n+2} + \frac{(n+1)(n+2)(n+3)(n+4)}{2.4(2n+1)(2n+3)} c_{n+4} \ldots\right]$$ (25B)

$n \geq 2$

$-b_0 + b_1 = F(1)$ $\quad -b_0 - b_1 = F(-1)$ (Heine §16)

Also second solution of $(1-y^2)\dfrac{\partial^2 z}{\partial y^2} + n(n-1) z = 0$:

for $|y| \geq 1$ $$H_n(x) = \frac{1}{2} J_n(x) \log\frac{x+1}{x-1} - \underbrace{\sum^{r=k} \frac{2(2n-4r+1)}{(2r-1)(n-2)}\left[1 - \frac{(2r-1)(n-2)}{n(n-1)}\right] J_{n-2r+1}}_{K_n(x) \text{ = rational integral function of } x \text{, of degree } (n-1)}$$

$$(1-\mu^2)\frac{\partial^2\psi}{\partial\mu^2}-(1-\rho^2)\frac{\partial^2\psi}{\partial\rho^2}=0$$

Any function of coord. which remains everywhere finite may be expressed by

$$\psi=\sum_{n=0}^{\infty} J_n(\rho)\, f_n(\mu)$$

On substituting: $\sum_0^\infty J_n\underbrace{\left[(1-\mu^2)\frac{\partial^2 f}{\partial\mu^2}+n(n-1)f\right]}_{\therefore\ =0}=0$

$$\therefore\quad \psi=\sum_{n=0}^{\infty} J_n(\rho)\left[A_n\, J_n(\mu)+B_n\, H_n(\mu)\right]$$

If n posit. integer, then $J_n(\mu)\,J_n(\rho)$ is a rational function of z, ϖ, of degree n

$$(1-\mu^2)\frac{\partial^2\psi}{\partial\mu^2}-(1-\rho^2)\frac{\partial^2\psi}{\partial\rho^2}=f_m(\mu)\ \varphi_n(\rho)$$

(3d) where f_m, φ_n are linear fn of $J_m(\mu)$ $H_m(\mu)$, $J_n(\rho)$, $H_n(\rho)$ $m \gtrless n$

particular integral:

$$\psi=\frac{f_m(\mu)\ \varphi_n(\rho)}{(n-m)(n+m-1)}$$

(3e): $(1-\mu^2)\frac{\partial^2\psi}{\partial\mu^2}-(1-\rho^2)\frac{\partial^2\psi}{\partial\rho^2}=-h^2\sum_0^\infty(\mu^2-\rho^2)\left[A_n\ J_n(\mu)+B_n\ H_n(\mu)\right]J_n(\rho)$ . . . (68)

$$\begin{aligned}\psi= C_0 &+ D_1\,\rho\\ &+J_2(\rho)\left[B_2\,\cancel{\rho}+C_2\,J_2(\mu)+D_2\,H_2(\mu)+E_4\,H_4(\mu)\right]\\ &+J_3(\rho)\left[B_3\quad+D_3\,H_3(\mu)+E_5\,H_5(\mu)\right]\\ &+J_4(\rho)\left[E_4\,H_2(\mu)+D_4\,H_4(\mu)+E_6\,H_6(\mu)\right]\end{aligned}$$

etc.

On

no higher power in μ can occur than μ^2

$$\left.\begin{aligned}\psi = & -\cancel{A_0 J_2(\rho)}, -\cancel{\frac{B_0}{3} J_3(\rho)} \\ & + \left[-\cancel{B_1 J_2(\rho) - \frac{A_1}{3} J_3(\rho)}\right]\rho \\ & + \left[\cancel{A_0 + (B_0} + \frac{B_2}{[illegible]})\mu\right] J_2(\rho) \\ & + \left[(\cancel{A_1} + B_3) + \cancel{[illegible]}\right] J_3(\rho)\end{aligned}\right\} \text{irregular terms}$$

$$+ C_2 J_2(\rho)$$

$$+ \sum_{n=2}^{\infty} E_{n+2}\left[H_{n+2}(\mu)\, J_n(\rho) + H_n(\mu)\, J_{n+2}(\rho)\right] + \sum_{n=1}^{\infty} D_n H_n(\mu)\, J_n(\rho)$$

Hasenöhrl [illegible] II [illegible] Wien Ber. (1906) 115 p 1005

Ortner [illegible] H in [illegible] Beibl. 31 p 694

Brillouin J d Ph 6 p 32 (1907) [illegible] molec. [illegible] Energie

Slotte Beibl. 31 p 79 (1907)

Ehrenfest Wien Ber. (1906) 115 p. 89 [illegible] statist. [illegible]

Poincaré J d Ph 5 (1906) p 369 [illegible]

Wood Physical Optics Macmillan 1905

Cotton Les ultramicroscopes Paris Masson & Co (1906)

Travers & Usher [illegible] temp. Z. ph. Ch. 57 p. 365–381 (1906)

Altschul Z. ph. Ch. 11 p. 578 (1893) Opalescenz!

Traube " 58 p. 475–478 (1907)

Wesendonk Naturw. Rdsch. 22 p. 145–148 (1907)

M. Travers & F. Usher [illegible] temp. Z. ph. Ch. p. 365–

I). [illegible] Mathias (de Heen, Traube) [illegible]

II). Opalescenz Altschul Z. ph. Ch. 11, 578 (1893) } opalescirende Bande
Wesendonk 15, 262 (1894)

Substanzen SO_2 oder $(C_2H_5)_2O$ in Natterer'schen Röhren [illegible] 0·8 cm [illegible] 20 cm [illegible] Jenenser Hartglas 1 mm [illegible]

a). [illegible]

b). [illegible]

c). [illegible] const [illegible]

d). [illegible]

e). [illegible]

Im Falle b [illegible] Opalesc. bei Annäherung an T_k [illegible]

dieses intensiver [illegible]

[illegible]

[illegible] (Minuten) ; [illegible] SO_2 [illegible] optische Discontin.

[illegible] 0·05° [illegible]

Opalescenz [illegible] $<0·1°$, [illegible] maximum $>0·05°$, [illegible] $>0·15°$.

Bei Äther [illegible] 2°

Zu Fall d). [illegible] : Opales. [illegible]

c). Opalescenz [illegible] [dasselbe [illegible] Umwandlung [illegible] Opales.]

[illegible] intensivste opal.; [illegible]

[illegible] diffund. ×

∴ Ähnlichkeit [illegible] kolloid. Lösungen , nicht molekulare Complexe aber nicht molekularen Aggregate:

Donnan Ph. Z. 46, 197 (1902)

1903: [illegible] Ans. : [illegible] Temp. [illegible] =0 , [illegible] Rad. , aber stabile >0

[illegible] Temp.

Also [illegible] Temp.intervalle kleine nicht molekularen Aggregate oder Tropfen [illegible]

[illegible] Phase [illegible] - stabile Zustände, [illegible] Aggregate [illegible] Opal. [illegible]

[illegible] Weise [illegible] liegt ausserh. unserer Discussion; aber [illegible]

Vol. [illegible] : da sie nicht molekular sind, [illegible] Phase

[illegible] > [illegible] Phase [illegible]

[illegible]

In der Beobachtung d. [illegible] (Cailletet) [illegible] sagt er ~~[illegible]~~: Der Meniscus verschwommen

an einem [illegible] - opales. [illegible]" „Der Menisc. wird nebelig und [illegible]"

Versuche scheinen bei diffusem Tageslicht ausgeführt worden zu sein

„Obs. [illegible] contin. [illegible] opal. [illegible]"

Ztschr. 26 p. 433 Rothmund [illegible]

Synthet. Methode ([illegible] § 120)

Übersättigung? Kein bei krit. Temp. [illegible] Ostwald: Lehrb. d. allg. Ch. 2 Aufl. II 2 349
aber könnte auftreten [illegible] temp. (Staub [illegible])

Beobachtung im Tageslicht gegen schwarzen Hintergrund

Rötlich. [illegible]: Opalescenz ; [illegible] Lehmann [illegible]

~~[illegible]~~ [illegible] temp. + 20 : Arrhenius Pogg. Ann. 151, 306 (1874)

Ztschr. Ch. 38 p. 385 Friedländer [illegible]

Ostwald Lehrb. II_2 683 : Opalesc. [illegible]

Isobuttersäure - H_2O : 28%

I) [illegible] Opales. [illegible] (Vol. [illegible], Opalescenz)

II) Viscosität Isobuttersäure - H_2O

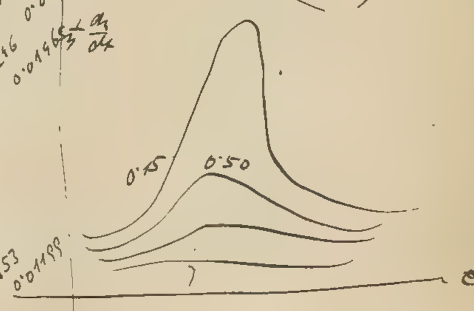
$\frac{1}{\eta}\frac{d\eta}{dt} \cdot 100$:

$\eta = \cancel{\eta_0}\,\frac{1}{a+bt}$

Visc.-[illegible] → Visc. [illegible] H_2O [illegible]

Abstand vom Sättig. p.

°C	Sättigungsgr.	0·15°	0·50°	2·50	10°	a	b
19·99	17·61	3·45	3·40	3·20	2·57	0·1812	0·01609
33·32	25·74	10·1	6·9	4·0	2·6	0·0246	0·01465 $\frac{1}{\eta}\frac{d\eta}{dt}$
36·30	25·80	19·4	9·6	4·1	2·8		
38·60	25·80	34·3	11·6	4·4	3·0		
41·00	25·77	26·1	9·6	4·2	2·7		
49·00	25·14	6·0	4·9	3·7	2·7	0·0453	0·01199



III). Opalescenz oder eigentlich Trübungsmessungen

38·6% t	: η
25·92	3·078
26·50	2·815
29·75	2·611
30·36	2·358
35·36	2·026
41·62	1·670

Isobuttersäure – H_2O

c	Sättigg.	Abstände v. Sättigg. 0·04	0·08	0·15	0·50	1·00
34·06	2·479	13	11	9	4	2·5
36·44	2·488	41	30	22	7·5	3
38·29	2·477	69	48	29	9·5	4·5
41·30	2·400	59	43	25·5	7·5	3
45·37	2·200	10	9	7	3	2

} ~~Die~~ Dicke einer äquivalenten Schichte trüben Glases

IV. Wärmeausdehnung

Es findet gar keine Anomalie in der Nähe d. krit. Punktes (bis 0·12°)

(Allerdings sind die Dichten von Isobuttersäure – H_2O / Phenol – H_2O sehr wenig verschieden!)

[Dagegen Phenol · H_2O: allerdings ein kleines Maximum von α für krit. Lösung.]

~~8 3~~

V.) Elektr. Leitfähigkeit

~~Anfangs Elektr. zu II:~~ $\frac{1}{k}\frac{dk}{dt}\cdot 100$ = 1·41 1·82 1·82 – 1·91 1·95 1·86 57·93%

c	$\frac{1}{\eta}\frac{d\eta}{dt}$	$\frac{1}{k}\frac{dk}{dt}$
14·99	3·0	1·41
24·25	3·4	1·47
33·32	8·7	1·82
36·30	18·0	1·82
38·60	32·0	–
41·00	17·3	1·91
49·00	4·2	1·95
57·93	3·0	1·86

∴ ganz unmerkliches Maximum.

VI.) Brechungsindex & Refraktion ganz normal nach Mischungsregel || ebenso für kolloide Lösungen

∴ Trotz starker Streuung so wie Lösungsmittel allein

[illegible] Opalen [illegible]

2. Stabilität (Rottmund [illegible] Capela)

[illegible] Kolbe [illegible]

[illegible] [Kl, koll. [illegible] H_2O] Kolopt.

[illegible] Kolopt. [illegible] oder [illegible]

er meint [illegible] Kolopt. [illegible] Opalen. [illegible]

Kolopt. [illegible] H_2O [illegible]

[illegible]

Alk.-Kolopt. [illegible] H_2O [illegible]

[illegible] coll. [illegible] (coagul. [illegible] Sl. [illegible]) [illegible]

[illegible]

[illegible]	22·65°				
t:	22·70	23·13	23·62	24·60	27·52
τ	56'26"	53'17"	51'26"	48'22"	41'14"

[illegible] Stabilität [illegible] [illegible] Diffusion [illegible]]

[illegible] Lehmanns halbbegrenzte Tropfen (Unsinn)

[illegible] Kolopt. [illegible] coaguliert [illegible] Opalen. [illegible]

Conclus. [illegible] Concentr. [illegible] 0·01–0·02° [illegible]

[illegible]

$\boxed{\text{Heptan – Benzylalkohol 50\% , krit. P. 23·5°}}$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] (1888)

[illegible]

[illegible]

[illegible]

[illegible] 55. [illegible]

[illegible]

[illegible]

Ref [illegible] Donner 1904

[illegible]

Ref [illegible] 1.78 [illegible]

[illegible] 1.17 – 0'88 [illegible]

[illegible]

[illegible] Ca[illegible] 1907 [illegible]

[illegible]

Antonow Journ. chim. phys. V 363

[illegible]

Schmauss Ann. 10, 352. ?, 186

on distinction ou ?

1). ↗ Wiener Ph. Z. 5 p. 332 (1904) Voigt : Ph. M. 34 (1892) p. 581

Drawn Ph. Z. 5 p. 332 (1904)

Havelock Pr. R. S. 77 A. 575. p. 170 (1906).

explique birif. et dichroïsme

Autours ne l'admettent, pourtant, parce que ± ? ? | ce n'est pas vrai · toutes les ligne élas. atteint.

2). Schmauss! on ne voit pas se former les ?

le moment Ch. contre ?

Tustin CR 136 ? 141 p. 3?

(1903) (1905)

? ? ?

? 0.001 ?

0.01

0.035

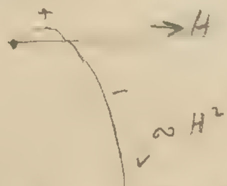
[illegible] + [illegible] ‖ [illegible] mêmes [illegible] ⊥ [illegible]
−
plus.

[illegible] + " ‖ " [illegible] par "

Kerr 1901 [illegible] p. 338 [illegible]

Majorana 1902 [illegible] anciens [illegible]

biréfr. de [illegible]



∼ épaisseur [illegible]

dans un champ intense
la différence de marche plusieurs longueurs d'onde

— [illegible] plus absorbée [illegible] produit une [illegible] biréfringente

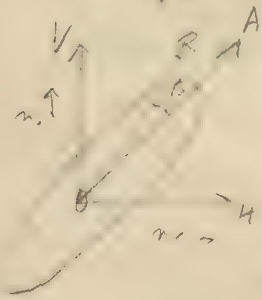
— pas de retard
— [illegible] ? épaisseur de [illegible] < 10 mm, parfois 0'5 mm —
lumière [illegible]
filtrée par liquide [illegible] (seulement [illegible] 1578.

méthode Chauvin Ann. Toul. 89

traverse 1). Nicol / pas être vu 2). lame $\frac{\lambda}{4}$ dont les [illegible] principaux [illegible]

[illegible] les plans

4). Analyseur à pénombre



la vibration devient elliptique à axes 45°

[illegible]

[illegible]

dans une [illegible] (OR)

e = épaisseur

$n_e - n_o = \frac{\lambda}{e} \frac{\delta}{\pi}$

si biréf. + : $n_e > n_o$

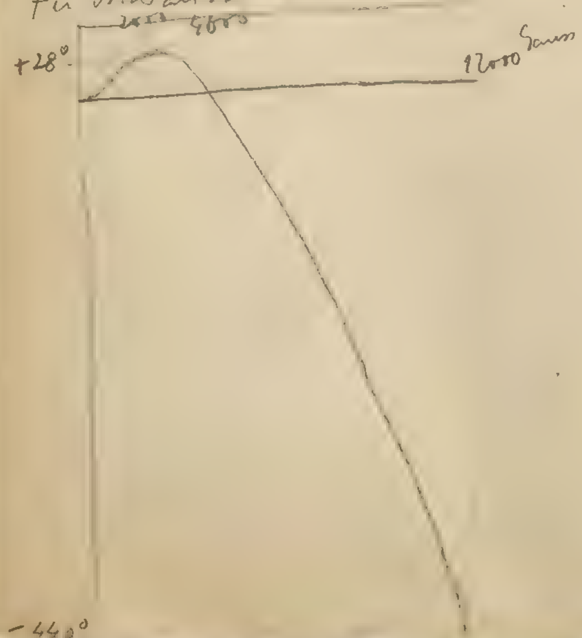
Quand liquide n'est pas très absorbant Δ déterminé à près de 0·0001 [illegible]

en enlevant la $\frac{\lambda}{4}$ le même appareil sert à étudier la rotation magnétique.

Lorsque biréf. et dichr. plus compliqué

Fer Marais [illegible] 1mm ép.

aussi [illegible] !



$n_o - n_e$ ca 0·002

↑ pour H = 10.000

n compris entre [illegible]

cellules coagulées [illegible] dans le champ, [illegible]

[illegible]

elle est plus [illegible], et ne disparaît pas avec le champ

[illegible] ; disparaît [illegible]

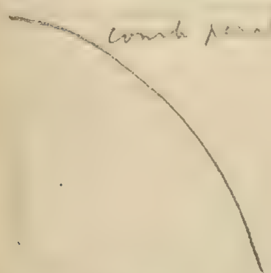
Avec liquide laissé en repos plusieurs mois

plus concentré en bas (en haut n = 1.3417 ([illegible]))
vers le haut : n = 1.3[illegible]

grains au fond se rapprochent de la position [illegible]

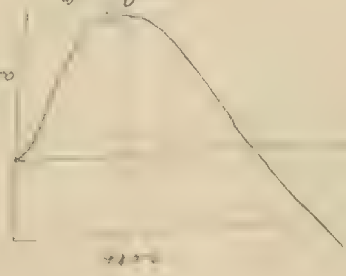
à la surface :

courbe parabolique



au fond :

350



deux sortes de particules ± [illegible]

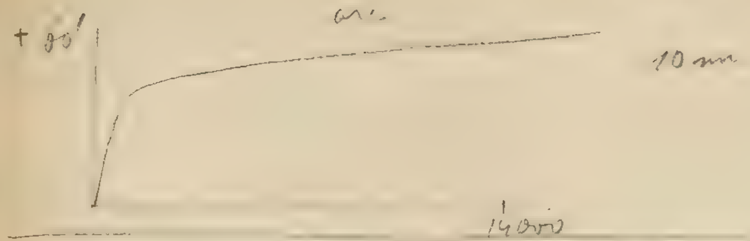
d'un côté [illegible]
avec des champs plus intenses [illegible] parabolique ne suffit point [illegible] !

— chauffage plus intense, [illegible]
inversion par chauffage prolongé

— [illegible] solution $FeCl_2$ [illegible] dialysé au papier parcheminé
très faible

hydroxyde ferrique

[illegible] [illegible] 3 mm [illegible]
; 70 [illegible]



Résine matière diverses pulvérisées dans [illegible] en suspension.
[illegible] dans des liquides divers

dichroïsme
lumière blanche non polarisée ; [illegible]
surtout [illegible] ([illegible])

polarisation biréf.

C × [illegible] : Na_2CO_3 [illegible] + [illegible] dilué [illegible] secondes
verre très [illegible] ; [illegible]
[illegible] cristaux [illegible] ; biréf. — ([illegible] 10)
[illegible]
puis [illegible]

et dichroïsme — analogue

Chauffer CR 142 ; 6 ; 301 poudres très fines
H E ! toujours biréf. saturation, valeurs [illegible] les mêmes !
preuve que la poudre [illegible] orientation

[illegible] | les [illegible] plus [illegible] avec [illegible]
rotation + [illegible]
rot. − [illegible]
[illegible]

dichroïsme circulaire faible

[illegible] en gélatine aimantation [illegible].
[illegible] ([illegible])

[illegible] [illegible] [illegible] [illegible] [illegible] partie

[illegible] [illegible] [illegible]

I) [illegible] [illegible]

Hamdouk : [illegible] [illegible] dimension et [illegible]
[illegible]

ce n'est pas
le cas dans les
[illegible]

[illegible] [illegible]

et [illegible] et [illegible]

± [illegible] | Ce [illegible] [illegible] pas
[illegible]

II) [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible]

Supposons [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] des particules

dans ce cas [illegible] et [illegible] +

[illegible] [illegible] — [illegible] : anisotropie des particules
ce qui est [illegible] dans ce cas les particules ne s'orienteront pas
[illegible] [illegible] dans la direction du [illegible]

donc [illegible] [illegible] ~~ainsi~~ sont anisotropes
particules de fragments [illegible]

[illegible]

[illegible]

CR p 229 [illegible]

nitrobenzène [illegible] + [illegible]

4·2 mm = 18150 $\rho = 36'$ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] + [illegible] $Cl_2 - 6$ [illegible]

[illegible] +

1880 [illegible] > 31000

[illegible]

[illegible] 60 [illegible]

[illegible] 0·24 [illegible]

CS. −0 [illegible]

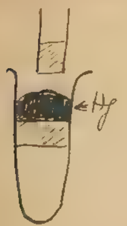
[illegible]

[illegible]

[illegible]

A. Stock Chemiker Ztg. 32 p 30 (1908)

Conische Ventile



Mischung von
Ton-Wasserglas-Gummi Chemin [illegible]

(von Blackman & Burger Berlin N. 24 Auguststr. 3a)

Hancock Results of Tests of Materials subjected to Combined Stresses Phil Mag. 16 p. 720 (1908)

Torsion combined with tension flexure, compression

1). Maximum Stress Theory (Amerika, England)

2). " Strain " (Grossherz) Coulomb, St Venant, Grashof

3). Maximum Shear Th. much more closely fitting than the others

difference between max & min tension

Siehe Hancock / Guest Phil Mag 1900 ; Scott Phil Mag 1907

Föppl III p 70 Winkelbildung: Coulomb, Tresca

Föppls Versuche: Marmor nicht homogenen Probekörpern durch allseitigen Druck bis 3500 atm.

dagegen inhomogene nicht (z.B. Krystalle ungenügende Druckfestigkeit)

III p 21 (2) = Eq ∫ : Schubfestigkeit (für Eisen etc) $= \frac{1}{2}$ Zugfestigkeit

während falls Längsdehnung massgebend ist, Schubf. $= \frac{1}{1+\mu}$ Zugf. sein müsste $= 0.8$

[dagegen stimmt das mit Annahme (3)!!]

Umschnürungsfestigkeit nach Föppls Versuchen = Druckfestigkeit [stimmt mit Annahme (3)!!]

Mohr'sche Hypoth. ist etwas allgemeiner als (3) insofern Grenze d. Elastiz. auch von [illegible] mittleren Druck abhängen kann.

Aber kommt auf (3) hinaus.

E. Williams Phil. Mag. 15 p 81 (1908) On the Rupture of Materials under combined Stress.

Tension & hydrost. Pressure: Rocksalt under atmosph. pressure 400 - 900 $\frac{gm}{mm^2}$

under nearly 1000 atmosph. according to Coulomb 10.000; observed 500-1000 gm

Alum. Wire without pressure 13.6 $\frac{Kg}{mm^2}$

700 atm. 13.8 "

700 atm = 7 $\frac{kg}{mm^2}$

Dr E W Hobson Pres.   Nature p 678 Vol 70
                                                Oct 31 1907

Dr Thomson S Ruhemann Vice Presidents

3- Isoamylen
Benzylalkohol
Heptan
Triäthylamin

Mr A E Shipley Dr E W James Mr P V Dewar
secretaries

New & Secondhand books Science
J Poole & Co
104 Charing X Rd

Natanson Ph M. 34 p 51 (1892)

[illegible]

[illegible]

[illegible] 5·12 %

[illegible] 18·20 [illegible] c = ca 30 %

[illegible] 24·15°

[illegible] 19·4°

[illegible]

Isobuttersäure Wasser 25·8° (conc. 38·6)

W. König Essen Löbestr. 23

Heptan-Benzylalkohol 50 % : 23·5°

$n = $ [illegible]

β-Collidin 6°
(Trimethylpyridin)

d = 0·078

[illegible]	[illegible]	
[illegible]	[illegible]	·02
[illegible]	1·40 (?)	0·73
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0·63
[illegible]	[illegible]	[illegible]
	[illegible]	

9410
II

42

Wied. Ann 57

C. R. 67 0 39

Fortschritte: L. I. 3464

Kolloide: Donnan. Ph. M.(6) 1 p. 647
Zacharias 2 ph Ch 39 p. 468
Whitney 2 p Ch 39 p. 630
Bruni Gazz Chim It. 31 pt I p 244
Lottermoser Anorgan. Kolloide Stuttgart 1901

Urbain Opfer ... Comptes rendus; Cox XXIX p. 526, 008, 787, 003 (1901)

Helmholtz Abhandl. 14747
II MC

Vorlesungen und Medien ... 1892/3

Über die Klärung trüber Lösungen Quincke 7 p. 57 (1902)

Absetzung fester Theilchen, Pech u. Quarztheilchen begünstigt durch saure Lösungen:
Scherer Pogg. Ann. 82 p. 419 (1851)

Schulze: Pogg. Ann. 129 p. 366 (1866): Trübungen v. Thontheilchen mit klärenden Flüssigkeit geben einen Bodensatz von grösserem Volumen als ohne.
Solche klärende Flüssigkeiten: Alaun, [illegible], Zinn, Kalk, $(NH_4)_2CO_3$, CO_2 $\frac{CaOH}{20.000}$

Schloesing: CR 70 p. 1345 (1870): Thontrübungen aus Ackererde bleiben oft Monate lang an. Klärung durch H_2O mit CaO oder MgO
10^{-4} bis 10^{-5} CaO fällen in 1-2 Tagen. Geschwindigkeit abhängig insbesondere von Salzmenge, sehr wenig von Schlammmenge. [illegible]

Barus: Bull. US geolog. Survey 36 p. 508 (1886) Bull. 12 p. 563 (1888)
Absetzen von Thontrübungen bei 100° 20 x schneller als bei 15°. [illegible] Flockenbildung u. Sedimentation.
Klärende Substanzen: Elektrolyte.

Bodländer: Götting. Nachr. 1893 p. 267; Jahrb. Min. 2 p. 147 (1893) Kaolin Trübungen
Befördern Elektrolyte, verzögern Isolatoren. Schwellenwert bei HCl = 10^{-6} Kaolin (1%). Auch CO_2.
Ohne Zusatz zuerst grösste Theilchen, mit Zusatz alles gleichzeitig. | Ähnlich Pech, Kieselsäure

Beibl. 22 (   )

p. 279 Painlevé CR 125 p. 1078 (1898). [illegible] transcendent.

p. 529 P. Gerber Räumliche u. zeitl. Ausbreitg. d. Gravitation
[illegible] Perihelbewegg [illegible] $\frac{41''}{100 J}$ [illegible] 3.10[10] [illegible]
Dagegen: Oppenheim [illegible] Gravitation Wien 1895

p. 14 H. A. Lorentz [illegible] Röhre ; krit. [illegible]

p. 629 Hicks Untersuchg [illegible] Wirbelbewegg 3. Theil Pr. R. S. L. 62 p. 332 (1898)
Sehr interessante [illegible] Anwendg auf periodisches System d. Elemente

p. 470 Mesnager CR 126 p. 515 (1898) Deformation der Metalle
1). [illegible]
2). Elast. [illegible] $\sqrt{1+p}+p : \sqrt{1+p}-p$
3). [illegible] El. El. [illegible] perman. Deform.

p. 132 Discussion über Ionisation und osmot. Druck Nature 55 (1897)
Pickering, Rayleigh, Kelvin, Gibbs, Larmor, Whetham

p. 745 Bodländer N. Jahrb. f. Min. Geol. Beilageband 12 p. 52 (1898) Über feste Lösungen
Zusammenstellung solcher Resultate. Im allg. keine Übereinstimmung [illegible] Lösungstheorie

p. 746 Roberts Austen Untersuchg [illegible] Legirungen Pr. R. S. 63 p. 447 (1898,

p. 747 Zsigmondy wässrige Gold Lösungen:
„Lösung: $\frac{0.6\,gr.\ AuCl_4H}{1000\,gr\ H_2O}$ } 25 cm³ verdünnt mit 100 – 150 cm³ H_2O

mit:
0.2 normale Lösung K_2CO_3 oder $KHCO_3$ } 2–4 cm³ versetzt und zum Sieden erhitzt

Nach Aufkochen entfernt von d. Flamme u. fügt ziemlich schnell, portionweise 4 cm³ von 1% Lösung von [illegible] frisch destill. Formaldehyd zur kochend heissen Goldlösung unter lebhaftem Umrühren."

So erhält man – rothe sehr verd. Au Lösung. Man kann aber durch Dialyse bis < 0'12 % Au erhalten. Lassen sich kochen, filtriren ohne abzuscheiden, verändern sich 3 Monate lang gar nicht. Au wird gefällt durch Salze, Säuren etc. wenn genügend vorhanden. Dabei momentane Blaufärbung, wo schon größere Stücke. Bei einem Ueberschuss pulverförmiger Niederschlag.

Bei Elektrolyse Abscheidung an + Elektrode als schwarzes Pulver welches nach Trocknen Metallglanz annimmt. Wird Elektrode mit Membran überdeckt so findet der Niederschlag darauf statt (Unterschied gegen colloidales Gold).

Liebigs Ann. Chem. 301 p. 29 (1898) | Zeitsch Electrochem 4 p. 546 (1898)

---

p. 749 Lineberger Koagulationsgeschw. coll. Lösungen

Untersuchte Koag. geschw. d. koll Eisenlösung, As lösg, Eiweisslösg und fand dass die in einem Theile erzeugte Koag. sich nicht durch die ganze Lösung verbreitet, dass daher keine Analogie mit übersättigten Krystall. lösungen

---

p. 287 Taylor Fällung von Salzen Journ ph. Chem. 1 p. 718 (1897)

aus Lösungen durch Zusatz von andern Salzen

---

p. 472–476 Unterkühlung und Krystallisation

Tammann u Friedländer Zsch ph. Ch. 24 p 152 (1897)

Krystallisationsgeschw. wächst bei Unterkühlung bis zu Maximum und nimmt dann wieder ab. Im mittleren Intervall (10–20° etwa) const.

Maximale Kryst.Geschw. pro minute:

P gelb	60 000 mm
Azobenzol	570
Diphenylamin	112
Benzophenon	55
Salol	4
Betol	1

Ebenso auch: Tammann Z. ph Ch 23 p 326

Tammann Abh. der Zahl d. Kryst. Kerne von Temp. Ztschr. ph. Ch. 25 p. 441 (1898)
mit steigender Unterkühlg. wachsen
bei starker Unterk., also rascher Abkühlg. erhält man amorphe, glasige Stoffe
wahrsch. alle Stoffe in diesem Wein.
Küster Z. ph. Ch. 25 p. 480 (1898). bestr. T. Ansicht von d. Unabh. d. Kryst. Geschw.

Ztsch. ph. Ch. 26 p. 152 Löslichkeitsbeeinflussung bei dreiionigen Salzen

Schaum Z. ph. Ch. 25 p. 722 (1898) Über U. Kryst. d. unterkühlten Benzophenons
schliesst aus seinen Proben d. die unterkühlten Zustände nicht labil sind
(Ostwald) sondern metastabil (wie Dämpfe mit Staubpartikeln) sehr wichtig!

---

p. 142 Lottermoser & Meyer J. pr. prakt. Ch. 56 p. 241 (1897). Kolloidales Silber
0·5 % Lösung Säuren fällen es als metall. Ag aus deren leichter zu grösser
Affinität.
Schwache Leitungsvermögen durch Ag elektr.

---

p. 141 Rodewald: Thermodynamik d. Quellung Z. ph. Ch. 24 p. 193 (1897)
berechnet Dampfspannung d. Stärke u. findet Molekulargewicht 4374
also $C_{161} H_{270} O_{135}$

---

p. 643 Abegg E. einf. Vers. z. Demonstr. d. Ludwig'schen Phänomens Z. ph. Ch. 26 p. 161 (1898)
= d. Temperaturdifferenz erfolgende Concentrationsunterschied in Fl. welche eine diff. Stelle sind.
Van t'Hoff theorie scheint zur Erklärung nicht anzuwenden ?
p. 827 Arrhenius Z. ph. Ch. 26 p. 187 (1898) Dasselbe. Nach V. H. ist conc. ~ $\frac{1}{T}$, dagegen
haben Versuche bald grösser bald kleinere Werte ergeben : 1·057 – 1·456 statt 1·133 + Cu SO₄!

---

p. 749
Kijers halbdurchlässige Wände sind nicht „Ionensiebe" (Ostwald) [illegible]

p. 388 Euler Innere Reibg. elektrolytischer Lösungen ? ? Ch 25 p. 5? 1898
Schlüsse ... Ionen

p. 292 Paschelis Versuch & Quellung (Gelatine)

p. 20 van Eldik ... Kapill. ...

Verdg. von Äthylen & Chlormethyl ; ... const. temp.

p. 293 Pockels: H_2O ... Adhäsion ... 20 ... CS_2,
$(C_2H_5)_2O$, Terp.öl, Oliv.öl etc.

p. 294 Mensbrugghe Extr. Ann. ... 20, 1 ... (1856)
Allg. Principien ... Theorie d. Capillarität

p. 477 Schallgeschwind. in Ätherdampf

p. 647 Schwächg. d. Schalles infolge Strahlung d. Luft
649 Lamb Schallg. in elast. Röhren
393 Boltzmann & ... Schmelzung
294 Kelvin Kohlenvorrath d. ... CO_2 ... : 340 Mill. t. ; ... : 146.000 Mill t

p. 765 Mack C.R. 127 p. 361 (1898) Schmelzp. einiger Körper bei hohen Drucken
Kein Maximum wie Damien ~~behauptet~~ und Demerliac behauptet
was schon von Hydrallen ... (W. Ann. 64 p. 725 1898)
Naphtalin, Naphtylamin, Diphenylamin, Paratoluidin
bis 2140 atm ziemlich linear von 86.4 – 150.6

p = 1 – 900	1 – 670	1 – 730
t = 48.5 68.7	52 – 70.5	79 64

p. 546 Englisch [illegible] Molekularbewegung d. Flüss. [illegible] Ref. unverständlich

p. 547 Lussana N. Cim. (4) 7 p. 61 (1898) Messungen d. spec. Wärme von CO_2
für temp. 16 – 97°, p = 30 – 145 atm | Maximum bei 110 Atm!

p. 25 Mache sp. w. von	Pd	0·0549	5·83
	Cr	0·1208	6·34
	V	0·1153	5·9
	W	0·0336	6·17

p. 832 Anderson Quant. [illegible] Wärmetö [illegible] d. Dilatat. [illegible] Compr. [illegible] Metalldraht
theoret. Formel von Thomson $c\,dt = \frac{T\alpha\,dS}{J\mu}$ [illegible]
bestätigt für Fe, Ni, Al, Zn [illegible] für J = 431·8 gefunden

p. 25 Sohncke Änd. [illegible] sp. Wärme [illegible] ~~[illegible]~~ [illegible] temp. : [illegible] Dispersion [illegible]
[illegible] sp. w. / [illegible] Elem. Hg Cd [illegible] von temp. [illegible]

p. 149 Lees [illegible] 45° [illegible] 20 [illegible] 300° [illegible]

p. 552 ~~[illegible]~~ Strauss [illegible] Eises: 0·307 – 0·312
0·301 – 0·328 } [illegible]

p. 553 H. Lamb [illegible] perodischer Struktur [illegible] . Mem. & Proc. Manch. Lit. Soc.
42 p. 1 (1898).
Modelle: [illegible] Saite [illegible] 20 [illegible]
select. [illegible] Ref. [illegible]

p. 479 Kiessling Z. ph. ch. Unt. 11 p. 19 (1898)
[illegible]:
Nebel [illegible] Tröpfchen. Homogener Staub [illegible] nicht [illegible]
sondern [illegible]

p. 389 L. Weber (Schr. d. n. V. f. Schlesw.-Holst. 11 p. 3 (1895) Plasticität d. Marmors: [illegible] 1'5 m [illegible] 0 5 [illegible] 5 cm [illegible] 17 Jahren [illegible] 21 mm [illegible]

p. 567 [illegible] Vorkopf [illegible] Ni, Cu Drähte [illegible] Ni [illegible] Elast. Nachw. [illegible] Ni [illegible] 1000 [illegible] Cu [illegible] 4000 [illegible]

p. 10 Krafft Strutz [illegible] H_2O Ber. Ch. G. 29 p. 1328 (1896)

Krafft [illegible] Theorie d. kolloid. Lösungen 1334

[illegible] Mol. [illegible] Mol. [illegible]

p. 844: Dorsey Phil. Mag. 44 p. 134 (1897)

[illegible] Oberflächenspannung von H_2O: 75·98 $\frac{\text{Dyn}}{\text{cm}}$ bei 0°

während [illegible]: 76·09

bei Lösungen lin. f. d. Concentration; doch ist gar keine Übereinstimmung [illegible] mit Dorseys [illegible] Volkmanns Result.

p. 845 Martini [illegible]: Atti R. I. Veneto d. Sc. (7) 8 p. 502 (1897)

Das Pulver [illegible] Therm [illegible] 16 [illegible] Er erhielt so größere Werte als andere Forscher [illegible]

CS_2 [illegible] $(C_2H_5)_2O$ [illegible] Kohlenpulver: 21° .. 20° während [illegible]: 17° 6°

Compression [illegible] Trockenheit [illegible] Feinheit [illegible] Pulv.

Entgegen [illegible] Pouillets [illegible] Fl. [illegible]

[illegible] Meissner: W. Ann. 29 p. 114 (1886)

Dasselbe: Phil. Mag. 44 p. 205 (1897)

Fällung von Solen aus wässrig. Lösungen d. Alkohol · Bancroft Bull. 19 p. 542

Löslichkeit [illegible] von Alkohol. Nachgewiesen [illegible] : Lobry de Bruyn :

: Bödtker Z. ph. Ch. 22 p. 505 (1897)

Innere Reibung H_2O:

p. 574 Knibbs R. S. N. Wales   Genaueste Discussion d. Theorie von Poiseuilles Methode

und Resultate

nach Poiseuille: $$\eta_t = \frac{0.017861}{1 + 0.03395\,t + 0.000235\,t^2}$$

nach Thorpe & Rodger : $1 + 0.023\,t + 0.0005\,t^2$ } zwischen 0 – 70°

Mittel aus verschied. : $1 + 0.035\,t + 0.0002\,t^2$

p. 576 Ostwald Z. ph. Ch. 22/4 289 (1897) Übersättigung & Unterkühlung

Präcisionskryoskopie:

Ponsot: Bul. S. Chim. (3) 15 p 1073 (1896)   Raoult · CR 123 p. 474, 631 (1896) ..

Ponsot CR 123 p 557 (1896) .   Raoult : [illegible]

Ponsot : [illegible]

---

p. 707 Santis } [illegible]

p 708 Monti

---

p. 407 Schenck Untersuchung d. krystall. Flüssigkeiten

---

p. 207 Kammerlingh Onnes Arch. Néerl. 30 p. 101 (1896) Allg. Th. d. flüssig. Körper

Voraussetzung $\frac{a}{v^2}$ Mol. anziehend glatte Kugeln von unveränd. Dimens.

Deutsch 1881 [illegible] Amsterdam

Daraus folgt:
$$R(1+\alpha t) = \left(p + \frac{a}{v^2}\right)(v - 2m)\,\chi\!\left(\frac{m}{v}\right)$$

Anwendg. auf krit. T. v., d. , Stud. d. Isoth. f. [illegible]

[illegible]

Emich
p. 405 & Entzündlichkeit dünner Schichten explosiver Gasgemenge Wien 18 p. 1057
Monatsh.

1). [illegible] 0·22 mm [illegible]

2). [illegible]

3). [illegible]

4). [illegible] H_2 O_2 1:1

~~877~~
853 Hartley sp. W. d. Fe $c = 0{\cdot}1012 + 0{\cdot}0_4\,506666\,t + 0{\cdot}0_6\,163998\,t^2$ } 0°–660°

750–1000 c = 0·213

954 –1006 0·218

1050–1200 0·199 [illegible] Umwandlg.

874 Lussana Elektr. Leitf. von Lösungen 1–1000 Atm 5–60° N. Cim. (4) 5 p. 357 (1897)

878 Coehn & elektr. Wanderung d. Kolloide Z. Elektroch. 4 p. 63 (1897)

Tannin, Caramel, Stärke, Jodstärke wandern zur Anode [illegible]

[illegible] 16 Coll. [illegible]

Colloide [illegible] Metallhydroxyde [illegible] Feinheit [illegible]

6 [illegible] Bezug [illegible] II

882 Picton & Linder Lösung & Pseudolösung III Theil (!) [illegible]

J. Chem. Soc. 71 p. 568 (1897)

[illegible] Kolloide oder Nicht ~~electrolyte~~ [illegible] Kat

[illegible] Anode, [illegible] elektrolyse

883 Kapillarelektr. (Theorie) Nernst Z. Elektrochem. 4 p. 29 (1897)

191 Lachaud Bull. S. Chim. (3) 15 p. 1105 (1896) [illegible]

Gepulvertes $MgCO_3$, MgO, $BaCO_3$, $CaCO_3$, Thierkohle ([illegible] Erden) adsorbiren, [illegible] Dextrin,

Gelatine, Tannin etc. [illegible]

720 Wilson: Pr. R. Soc. 61 p. 240 (1897) [illegible] / [illegible]

Bei Expansion [illegible] $10^{-?}$ [illegible] $\frac{v_2}{v_1} > 1{\cdot}252$

dabei Conden. regenartig bis

$\frac{v_2}{v_1} > 1{\cdot}37$ wo Cond. wolkenartig [illegible]

[illegible] O_2, N_2, Cl_2, CO_2 [illegible] H_2 [illegible] regenartige Cond.

Wirkung d. Röntgenstrahlen: [illegible]

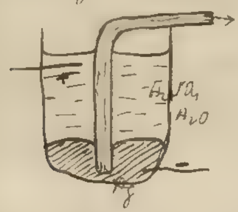
Daraus folgt [illegible] Cap. [illegible] Cond. [illegible] regen Cond. äquival. [illegible]

[illegible] $r = 8{\cdot}6 \cdot 10^{-8}$ cm [illegible] wolken Cond. $r = 6{\cdot}4 \cdot 10^{-8}$ cm

[illegible]

---

355 Chassy [illegible] Versuch [J. d. Ph. (3) 6 p. 14 (1897)]



[illegible] (Filtration");

---

412 Guillaume D. Temper. d. Raumes [La Nature 24 p. 210 (1896)]

= temp [illegible] Stefan [illegible] Temp. d. ☉: 7000°

[illegible]:

☿	+ 156	♂	+ 32	♄	− 80
♀	+ 94	kl. Pl.	− 9	♆	− 102
♁	+ 65	♃	− 49	*	− 132

---

075 Schaum Die Arten d. Isomerie: chem. Isom. [illegible] physik. Isom {letztere [illegible]

amorph [illegible]

Beibl. 20

p. 679 Bartoli u. D. Stracciati: Rendic. Ist. Lomb. 28, 29 (1895) (1896):

Kohlenwasserstoffe $C_n H_{2n+2}$: Compressib. β ...

	Siedp.	Dichte bei 0°	β.10⁷ bei 23°	C	c	C/c
$C_6 H_{14}$	68°	0·6950	1592	0·5042	0·3719	1·355
$C_7 H_{16}$	93°	0·7328	1341	0·4842	0·3776	1·282
$C_8 H_{18}$	117°	0·7463	1214	0·5111	0·4084	1·251
$C_9 H_{20}$	137°	0·7624	1125	0·5015	0·4003	1·252
$C_{10} H_{22}$	160°	0·7711	1054	0·5058	0·4065	1·244
C_{11}	181	7817	974	5032	4069	1·236
C_{12}	199	7915	917	5065	4102	1·234
C_{13}	219	8017	874	4987	4039	1·233
C_{14}	238	8130	827	4997	4090	1·221
C_{15}	260	8229	787	4991	4099	1·217
$C_{16} H_{34}$	280	8287	754	4964	4142	1·198

p. 831 Brill stationäre Bewegung zäher incompr. Flüssigkeiten Pr. Camb. Ph. Soc. 8 p. 313 (1895)

p. 92 Galitzin Molecularkräfte und Elasticität der Molecüle (Bul. Ac. Imp. Petersb. (5) 3 p. 1 (1895)

! ||| ...

p. 244 Mügge N. Jahrb. f. Min. 2 p. 211 (1895) über die Plasticität d. Eiskrystalle

~~...~~ ...

p. 956 Weinberg Molecular Th. Adhäsion d. Metalle auf Glas

p. 182 Hicks Adresse an d. math. u. physik. Section Brit. Ass. Ipswich (1895) (Sep. 12 p.)

...

p. 334 Tokowkin Z. ph. Ch. 18 p. 585 1895

~~...~~ ...

p. 835 Parenty [illegible] (Ann. Ch. Phys. 7 8 p. 5 (1896)

[illegible]

p. 846 Roberts-Austen U. d. Diffusion der Metalle R. R. S. 59 p. 281 (1896)

in geschmolz. Substanzen: $\frac{\partial v}{\partial t} = k \frac{\partial^2 v}{\partial x^2}$ k in $\frac{cm}{tag}$ folgende Werte:

Au in	Pb	3.19	bei 500°	Rh in	Pb	3.04	bei 500°
	Bi	4.52	"	Pt in	Pb	1.69	490
	Sn	4.65	"	Au in	Pb	3.03	490
Ag in	Sn	4.14	"		Ag	0.72	11
Pb in	Sn	3.18					

Pr. R. S. 67 p. 101 (1900)!

k für Au in Pb:	100°	165°	200	251°
	0.0000[illegible]2	.0.004	0.007	0.03

[illegible] Diff. von Au in Ag, oder Au in Cu bei 800°

---

p. 676 Umani N. Cim. (4) 3 p. 151 (1896) [illegible]

findet für η (in Rohr) von Hg 10° .... 0.01577 [illegible]

[illegible] 17.2 η = 0.01602

---

p. 674 Rodewald [illegible] Quellung d. Stärke

[illegible], compress., [illegible] Quellungs[illegible]

---

p. 712 Guye [illegible]

[illegible]

[illegible]

---

p. 13 Wyatt u. Randall [illegible] Molek. Konstitution [illegible] [Am. Chem. J. 17 p. 461 (1895)

Chem. Centralbl. 2 p. 278 (1895)] [illegible] Eötvös, Ramsay & Shields

Guye, Young [illegible]

p 343 Verschaffelt Cap [illegible] ursprünglich [illegible]

Rad. d. Röhr. 0.0873 mm

CO_2	$t = 20.9$	$h = 4.29$ mm	N_2O:	$t = 19.8$	6.74 mm
	15.2	6.69		14.4	8.91
	8.9	8.41		−24.0	23.90
	−24.3	22.37			

Nach V. d. Waals [illegible] oberfl. Energie $6 = A(1-m)^B$ [illegible]

(Z. ph. Ch. 13 p. 716) [illegible] $A_{CO_2} = 1.934$ | $B = 1.3$ [illegible] CO_2

N_2O 1.945 | 1.337 N_2O

[illegible] V. d. W. $B = \frac{3}{2}$ ~~[illegible]~~

[illegible] der Diff. Quot. [illegible] molek. Oberfl. Energie

$\frac{\partial 6_M}{\partial t}$ soll nach d. Theorie (Kamerlingh Onnes, V. d. W., Eötvös) [illegible] $= 2.27$ [illegible]

[illegible]

CO_2	$\frac{\partial 6_M}{\partial t} = 2.222$	$15.2° - 8.9°$	
	2.223	$8.9 - -24.3°$	[illegible]
N_2O	2.198	$14.4 - -24.0$	

p 767 Houllevigue J. Phys. (3) 5 p 159 (1896)

[illegible] $L' = L - \frac{2A}{E \rho D}$

[illegible] $\rho > \frac{2A}{EDL}$ [illegible] $> 10^{-7}$ mm

[illegible] temp $= 0$

p 351 Sutherland Viscosität gemischter Gase Phil. Mag. 40 p 421 (1895)

p. 485 Stoletow Gedächtnisrede auf Helmholtz
für mechanische Naturanschauung, gegen Energetik (Symbolismus)

p. 632 Meyer Ph. Mag. (5) 41 p. 168 (1896) Akustische Untersuchungen
Temperaturabhängigkeit d. Elastizität zw. 0° u. 100°
Dauer des Tönens! (= 20, d. Schwingungen!)!
M. U. zeigen Abnahme, ~ b d. 20° — 0° 75 sec, 100° 45 sec.
Al. 40, 12 A.
Neusilber 80, 5

640 Amagat $\frac{C}{c}$ berechnet für CO_2 ...

857 Dussy CR. 123 p. 305 (1896)
sp. Wärme d. S — 160°–201° 0·279; 160–232·8 0·300; 160–264 0·300; 201–232·8 0·331; 232·8–264 0·324

p. 76 Dreyer ... Einfluss d. Centrifugalkraft auf chemische Systeme Z. ph. Ch. 17 p. 459 (1895)

p. 684 Weber Wärmeleitung einiger schl. leitender Körper
Marmor 0·0054, Quarz 0·01576, Anhydrit 0·00123, Steinsalz 0·0137
Kreide 0·0017, Basalt 0·00317, Gyps (künstl.) 0·0009, Gyps natürl. 0·0031
Retortenkohle 0·01031
sp. Wärme 0·16 – 0·25

p. 863 Trabert Die Grenze d. Übersättigung Met. Z. p. 190 (1896)
Messungen ... Wilson 8 ...

p. 867 Ouadicentini Verbrennung in verdünnter Luft

p. 869 Holborn u. Wien Bestimmung des Wärmeleitvermögens d. Metalle ...
Dissonanzen: Mittelwerte k
Cu 0·918; Stahl 0·062–0·111; Sn 0·150
Fe 0·156; Zn 0·292; Pb 0·079
$\alpha_{Cu} = +0·000167$ $\alpha_{Fe} = -0·001011$ (?!)

p. 868 Quick, Child, Lampson Ph. Rev. 3 p 1 (1895) Ch & Cu

~~K 52 - 130~~ $K\left(\begin{smallmatrix}-130\\-54\end{smallmatrix}\right) = 0.994$ Cu

$K\left(\begin{smallmatrix}166\\74\end{smallmatrix}\right) = 0.954$

p. 871 Verbindungen Lussana ... J_2 (?) ... 26°
... 49° ...

Dasselbe:

p. 971 Rebenstorff Z. ph U 9 p. 227 (1896) $2 AgJ, HgJ_2$ roth ... 40-45°

p. 972 Hall Wärmeleitung von Stahl

bei 27.2° : 0.1325

59.2° : 0.1300

p. 968 Moissan & Gautier Ann Ch. Ph. (7) 7 p 568 (1896)

sp. Wärme des amorphen Bor

	0° - 100°	100° - 192.3	192.3 - 234.3
	0.3066	0.3776	0.4333
also Atomwärme	3.372	4.153	.4766

also erheblich > als für krystallis. B. nach Weber

p. 968 Trabert Verdampfungswärme. Met. Z. 13 p 261 (1896)

p. 360 Bakker Innere Verdampfungswärme Z. ph Ch. 18 p 519 (1895)

Formel welche aus V. d. W. folgt ... Nernst & ...

p. 139 Maltézos [illegible] CR 121 p. 303 (1895)

Im Anschluss an Arbeit v. Bliss Ph. Rev. 2 (1895) [illegible]

[illegible]

[illegible]

Fuchs' Theorie : capill. Wirkung   Erklärung [illegible]

---

p. 949 Förster's El. Coeff. [illegible] : Z. [illegible] Phys. 41 p. 258 (1896)

Nach Poisson $E = \frac{\pi}{3} \sum_{r=\alpha}^{\infty} \frac{r^5}{\alpha^5} \frac{d\left(\frac{1}{r}\right) f(r)}{d r}$ r = [illegible] Rad. d. Mol.
α = [illegible]
$f(r)$ = [illegible]

Nach d. Werthen v. [illegible] $q\,\alpha^7$ nahezu constant für alle Metalle (?)

$\therefore \quad E\left(\sqrt[3]{\left(\frac{A}{S}\right)^7}\right) = \text{const}$ A = Mol. G. S = spez. G. $\sqrt[3]{\frac{A}{S}}$ = [illegible]

Aus einigen Hypothesen folgt dass $(K.\, D.\, c)^{7/3} = E$ was eine Tabelle bestätigt

const. [illegible] [illegible]

Wszechświat 20 (1901) p. 830

Według balon-sondów francuskich (w liczbie 240!):

	na poziomie	Temperatura 5000 m.	10.000
Styczeń	0·9	−18·9	−52·4
L.	5·4	−15·3	−47·6
M.	1·0	−21·8	−53·4
K.	0·9	−20·9	−53·7
Maj	5·3	−18·4	−49·3
Cz.	7·0	−16·8	−51·3
L.	14·2	−8·8	−45·3
S.	15·7	−8·7	−44·5
W.	17·8	−7·2	−41·8
P.	13·4	−9·7	−47·9
L.	10·2	−11·0	−45·1
Grudzień	5·8	−12·8	−45·2

~~Ostwald twierdzi spasienia i zatrz. H_2 = 0·56~~

Fortschr. d. Ph. 1900

p. 185 Reinganum Th. d. Zustandsg. u. der innern Reibg. der Gase

~~Ann. Phys.~~ Ph. Ztschr. 2 p. 241 (1901)

~~Zustands Gl.~~ : $(p + P_i)\left(v - b e^{\frac{c}{T}}\right] = RT$

für grosse Vol. : $P_i = \frac{1}{v^2} f\left(\frac{c}{T}\right)$

innere Reibg : $\eta = \dfrac{0\cdot 3503 \cdot \rho u}{\sqrt{2} \cdot N \pi \sigma^2 e^{\frac{c}{T}}}$ $u = \mathfrak{v}^{\text{te}}$ ges. d. Mol.

p. 186 Guye & Friederich Études numériques sur l'équation des fluides

Ph. Z. 1 p. 606 (1900)

Berechnung der Werthe a und b für 83 Substanzen

A. Denizot 1898 üb SO_2 ? Ztg d. Nat.
25 f. Kälteind. 6 p. 69 (1899)
weist nach dass aus Plancks Thermodynamik 115 p. 138 folgt, dass die Verdampfungswärme
linear abnehmende Fc. der Temp ist, was auch hier zutrifft.

p. 193 Amagat Journ Phys. (3) p. 417 (1900) Soc. Fr. d. Phys. Séances 1900 p. 173, 50
Isoth. v. Gas v hohen Druck u Temp. ; c_v CO_2

Berthelot CR. 130 p. 115 (1900) f^e ; Kritik d $p+\frac{a}{v}=\frac{RT}{v}(1+\frac{b}{v}+\ldots)$

p. 196 Arch Néerl. (2) 5 p. 417 (1900) Isoth. u f^e

VdWaals Arch. N. 5 p. 407 (1900)
Unters. Mittl auf Grund d. Annahme eines innern Druckes (d. von T unabhängig ist) constituirende
Abhängigkeit d. Ausdehnungscoeff. d. Dampfes u d. Flüssigkeit:

$$\frac{dv_1}{\beta_1}+\frac{dv_2}{\beta_2}=0 \qquad (v_1, v_2 = \text{sp. Vol. Gas u. Flüss})$$

$\beta_1\ \beta_2$ = Compressib. Coeff

Bancroft Rights des phases J. d. Ch. 9 p. 5 (1900)

V. d. W. p. 208 Joule-Thomson Versuch b. Wasserstoff u. V.d.Waals Gl.
a as temp fn

p. 210 Reinganum ? Anh. N. 5 p. 574 (1900)
Vierial zu Form: $p+P_i=\frac{RT}{v}\left(1+b\,e^{\frac{c}{T}}\right)$

$$P_i=\frac{Rbc}{v^2}\left[\log c-\log T+\frac{c}{T}+\frac{1}{2.12}\frac{c^2}{T^2}+\cdots\right]$$

Fortschr. d. Ph. 1900 II

p 59 Behn Dichte von CO_2 [illegible] Wied. Ann. 3 p 733 (1900)
beim Drucke d. ges. Dampfes

	−60°	−50	−40	−30	−20	−10	0	+10	+20	+30
ρ CO_2 fl.:	1.191	1.154	1.116	1.075	1.031	0.981	0.925	0.860	0.772	0.598
[illegible] Coef.	0.00267	274	292	422	468	525	602	735	1080	0.0470

ρ CO_2 : fest 1.53

p 68 Ramsay & Travers Argon [illegible] Z. ph. Ch. 35 p 634

	He	Ne	A	Kr	Xe
Dichte (Luft=1)	0.1238	0.2345	0.968	1.449	2.364
Spez. Dicht. (O=16)	1.98	9.97	19.96	40.88*	64
Sdp. (760 mm) abs.			86.9	121.33	163.9
Krit. Temp. abs.		< 68°	155.6	210.5	287.7
krit. Druck			40.2 m	41.24 m	43.5 m
[illegible]			0.0250	0.0467	0.0675
[illegible] 1 cm³ fl.			1.212	2.155	3.52
Molec. Vol.			32.92	37.84	36.40

→ [illegible] für Kr: 29.5

p 88 Rodewald Quellungs- & Benetzungswärme Z. ph. Ch. 33 p 593 (1900)

Weizenstärke: [illegible]

[illegible] : 1.28 m²

Adhäsionsarbeit [illegible] : 9.97 $\frac{mg}{mm^2}$

[illegible] Molec. [illegible] : [illegible] 45500
62800

[illegible] : 25000 − 33000

+ 98 Lobry de Bruyn [illegible] R. trav. chim. d. Pays-Bas 19 p. 251 (1900)

[illegible] Suspension [illegible]

[illegible] Partikel [illegible] coll. [illegible] polar. [illegible] $\frac{1}{50} - \frac{1}{100}$ $\lambda =$

5 – 10 $\mu\mu$.

[illegible], Eiweiss [illegible] cca 1000 [illegible]

[illegible] Vol. [illegible] coll. Sol. cca 100 [illegible] Suspend. [illegible] cca 5 $\mu\mu$

[illegible] Elektrolyte [illegible] N. [illegible] pseudo [illegible].

[illegible] Kristallisation. [illegible] Spring (solutions optiquement vides)

[illegible] Tyndall'sche optische [illegible]

Bredig & Cocken [illegible] coll. [illegible] Z ph Ch 32 p 129 (1900)

[illegible] coll. [illegible] feine Suspensionen [illegible] Stoeckl & Vanino (Z ph Ch 30 p. 98)

& Stark W. Ann [illegible] 68 p 117, 618 (1899) bekannt. [Davy & Schroeder (1851)

Linder & Picton 1892, 1895, Bredig 1898]

[illegible] coll. [illegible] elektr. pol. [illegible]

[illegible] Entscheidend [illegible] Susp. = [illegible]

[illegible] Ch. [illegible]

[illegible] El. Ch. [illegible] Collo[illegible]

[illegible] El. [illegible]

$ZnCl_2$ – [illegible] hydrolysirt [illegible] $Zn(OH)_2$ [illegible]

p. 99 Zsigmondy [illegible] [illegible Stöckl & Vanino] Z. phys. Ch. 33 p. 63 (1900)

1). [illegible]

2). [illegible]

3) [illegible] $CuSO_4$

4). [illegible]

5). [illegible]

6). [illegible]

7). As_2S_3 [illegible] Thonfilter [illegible]

Stöckl & Van. Replik 34 p. 378 (1900)

Fabre [illegible] Notiz [illegible] 2 p. 843 (1900)

---

p. 110 Saunders The allotropic forms of Se J. phys. Chem. 4 p. 423 (1900)

[illegible] : 3 [illegible] : ~~[illegible]~~ = amorph
roth. kryst.
grau kryst. (met.)

[illegible] 220° [illegible] 30–40° glasig [illegible] Zeitschr. Lehmann's [illegible]

[illegible] 217° [illegible] met. [illegible] ; [illegible] 185°

Amorphes Se [illegible] 1000 [illegible] CS_2 ; met. Se [illegible]

[illegible]	Amorph	Met.
−20 +10	0·0747	0·0745
+20 50	0·107	0·0840
20 90	0·103	0·0820

Sp. G. 180–250	
amorph.	4·26
glasig	4·28
rot. kryst.	4·47
met.	4·80

p. 114 [illegible] × colloid. Cadmium Z. ph. Ch. 32 p. 127

[illegible] 216 [illegible] zerstäubt [illegible] Cd-Kathode [illegible] 5-10 Amp.
30-40 V. braune Lösung [illegible]
coaguliert.

---

p. 115. Lobry de Bruyn [illegible] gelatinöse [illegible] 10 [illegible] Chem. Centralblatt 1900,2 p. 888
[illegible] gelat. Lösung [illegible]
coll. [illegible] Ag, Au, Ag_2CrO_4 [illegible]

---

p. 124 Tanatar ~~[illegible]~~ [illegible] Verbrenn. [illegible] Gase Z. ph. Ch. 35 p. 340 (1900)
Entzündl. [illegible]

p. 125 Emich × Expl. Gasgemenge Wien Ber. 109 p. 554 (1900)

---

p. 218 Hulett Z. ph. Ch. 33 p. 237

Amagat: Compressib. f. Hg 3.9. 10^{-6}

& Compr. [illegible] dest. : 45.3 . 10^{-6} .. 9°
44.6 17
41.9 50°

p-Toluidin (β 45.70) : 5?2. 10^{-6} (45°)

---

p. 219 Tumlirz Compr. [illegible] Wien Ber. 109 p. 837 (1900)
[illegible] V. d. W. [illegible]

---

p. 226 Rayleigh Viscosity of gases. $\frac{\mu'}{\mu} = \left(\frac{\theta'}{\theta}\right)^n$ ~~Chem. News~~ Pr. R. S. 66 p. 68 (1900) 67 p. 137

[illegible] Sutherland: $\frac{\sqrt{\theta}}{1+\frac{c}{\theta}}$

	n	c
Lu ✓	0.754	111.3
O_2	0.782	128.2
H_2, He	0.681	72.2
A [illegible]	0.801	
A [illegible]	0.815	150.2

Gulli Rossander Om gasers utströmning genom kapillarrör vid låga tryck. 48 S. Akademisk afhandling Upsala 1900

Transpir. [illegible] 16 mm [illegible], CO_2 H_2

[illegible] $r = 0.37,\ 0.11,\ 0.17$ mm

[illegible] 35 ξ([illegible]) [illegible], ξ [illegible]

[illegible] Result.

Donnan Effusion of gases Phil. Mag. 49 p. 423 (1900)

p. 252 Slotte Elast. [illegible]

[illegible]

$$c = \left(\frac{3.543\ e_0 b \gamma}{\mu_0 s_0} - 1\right) b \qquad c = \left(\frac{37.76\ e_0 b}{\mu_0 s_0 c_p} - 1\right) b$$

$$c = \frac{e_0 (t_1 - t) - e t_1}{e t_1 t}$$

b = lin. [illegible] Coeff., t = temp C, t_1 = [illegible] t, s = [illegible] ; γ = Vol. [illegible] ; ρ = [illegible] ; c = [illegible] $\rho = \rho_0(1 + c\,t)$

[illegible] Ag Pt Fe

[illegible] σ_0 $[\mu = e_0 \rho_0 = 3(1 - 2\sigma_0)]$

[illegible]

	c
Ag	0.000167
Pt	0.000043
Fe	0.000081

[illegible]

[illegible] :

	e_0	t	e	ber	ϑ	beob
Ag	7644	20	7349	908	898	950-1000
		40	7262	937		
		50	7123	848		
Cu	12711	20	12286	1040	1096	1050-1100
		50	12065	1151		
Al	7200	20	6794	661	716	600-700
		40	6698	721		
		50	6606	767		
Fe	1) 19385	20	19037	1939	2184	1599 · 1600
		40	19004	2428		
	2) 20694	50	19570	1013	1613	
Pt	16450	20	16079	1429	1235	1700
		50	15610	1040		

---

p. 253 Schaefer [illegible] El. [illegible] Verh. D. ph. S. 2 p. 122 (1900)

[illegible] +20° — temp. −70° [illegible] −186° C

1). El. Modul $\eta_t = \eta_{20}(1-\alpha(t-20))$ [illegible]

Tors. Modul $k_t = k_{20}(1-\beta(\ \ ))$

2) μ [illegible] temp.

3). [illegible] therm. [illegible] temp. | [illegible]

4). [illegible] Al. Ag Cu [illegible] ; [illegible] −180° [illegible]

5) El. [illegible] temp.

6). $1+\mu t = (1+\mu_{20})\,\dfrac{1-\alpha(t-20)}{1-\beta(t-20)}$ | $\mu = \frac{1}{2}$ [illegible] temp.

	Ausdehn. Coeff 0°–100°	k_{20} $\frac{kg}{mm^2}$	Δk pro 100°	η_{20}	$\Delta\eta$	μ_{20}	Zugfestig. bearb.	Zugfestig. [illegible]
Pt	[illegible] $\cdot 10^{-6}$	[illegible]	1·78	[illegible]	[illegible]	0·215	[illegible]	[illegible]
Pd	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ni	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Au	[illegible]	—	[illegible]	—	—	[illegible]	[illegible]	[illegible]
Cu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ag	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Al	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	665	
Zn	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	
Pb	[illegible]	556	[illegible]	[illegible]		[illegible]	[illegible]	

p 255 Gray Blyth Dunlop Temp. co. of ~~Young's Modul~~ temp. co. ca 20–100°

	k 10^{12} $\frac{Dyn}{cm^2}$	procent pro 1°	nach Rigidität
Ac Neusilber	1·3046	0·000 397	0·000 528
Weicher Stahl	2·1279	247	338
do	1·0257	373	352, 247
Cu (Ho)	1·1132	155	392, 413
elektr. (2/f?)	1·2954	436	0·00111, 149, 160
Fe a	1·545	197	0·00041
b	1·5578	136	54
c	1·3536	136	37

p 265 Adams & Nicholson Exp. invest. into the flow of marble Nature 62 p. 335 PhR S. 67 p 220

Abschnitt [illegible]

190 Benton Ann. der Ph. 3 p 471

Poisson'sche Zahl: Stahl 0·2755 Ni 0·32

Fe 0·288 do 0·331

Cu 0·341 Neusilber 0·37 [illegible]

Dolter Th. e Cap. El. Z. ph. Ch. 33 p 477, 34 p 168

V. ph. s Vadi. V. Ohm

Ostwald Z. ph. Ch. 34 p 495

Knipp. Cap. °C & 100° Ph. Z. 2 p 345

M. 20° — 75.22 Dyn

200° 34.35

Dutoit & Friderichs Cap. cont. of org. ph. CR 130 p. 327

1. L. Ramsay–Shields & pure liquids is 1 Pt.

Grunmach Cap. cond. Gase Ann. Ph. 4 p 367

SO_2 -25 = 33.285

NH_3 -29 = 41.778

Cl_{-72} = 33.6483

$\int$ Eötvös $M = \sigma\left(\frac{2.27(\theta - t)}{\alpha}\right)^3$

ok!

Gr.

~~Forch Ph. Z. 1 p 177~~

Cap. cont. of $\frac{1}{s}$: 1.23 $\frac{mg}{mm}$

Rel. by cap. $\eta = 0.0033$

Fortschr. d. Phys. 1900

180 Wien Üb. elektronentheorie & Mechanik Arch. Néerl. (2) 5 p. 96 (1900)

Fortschr. 1899

~~436~~ 443 Vacher & Finazzi Cim. (4) 10 p. 435 (1899)

Anomalie dell'attrito interno dell'acqua in prossimità di 4 gradi

zw. 0 u. 40 nichts Anomalie : temp. coeff. der f 40 u 50 ...

444 Tammann Zph. Ch. 28 p. 17 (1899)

Üb. Viscosität unterkühlter fl.

Piperin t	95°	90	85	80	75	70	65	60	55	50	45	40
	0.158	0.25	0.57	1.06	2.24	5.50	12.2	33.–	87	270	5000	20000

Betol t	50	45	40	35	30	25	20	15	10	5	0
	0.014	21	30	95	0.157	0.64	2.65	10.6	46.0	219	580

Betol spec. Vol.: $v = 0.74784 + 0.0002650\,t$

Oberfl. Spg. α: $16.45 + 0.035\,(100 - t)$

Ebenso für andere Stoffe (Traubenzucker, Rohrzucker, etc.)

Weinstein Üb. Vh. d. Poiseuille'schen ... Wied. Ann. 68 p. 441 (1899)

$$\eta = 2800\, e^{-2{,}3\,\theta^{\alpha}_{t}}$$

p. 499 Segel Üb. Vh. & Zts. ... elast. ... Ph. Z. 1 p. 126 (1899)

Youngs Modulus:

Paraffin	$t = 5.7$	6.9	13.1
	$E = 223.4$	210.7	177.0
Wachs	$t = 11.5$	19.4	
	$E = 59.1$	46.6	

57

(2) [illegible]

[illegible]

(3) [illegible]

[illegible]

$0 = $ [illegible]

[illegible] $\cdot H!$

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible] 1.75	[illegible]
H_2	[illegible]		[illegible]	[illegible]
CO_2	[illegible]		[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]

[illegible]

Sektion „AUSTRIA"
des
deutschen und österreichischen
ALPENVEREINS.

Wien, 11. Jänner 1904.
I., Wollzeile 22.

Euer Hochwolgeboren!

Beiliegend übersenden wir die Mitgliedskarte pro 1904 und nachdem der Jahresbeitrag für außerhalb Wien wohnenden Mitglieder mit 13 K festgesetzt ist, so ersuchen wir höflichst um die Einsendung des noch fehlenden Betrages von 1 K, event. in Briefmarken.

Hochachtungsvoll

für die

[illegible]

p. 508 Pockels Naturw. Rdsch. 14 p. 383 (1899) [illegible]

[illegible] $e = 0$

p. 528 **Whetham** The coagulative power of electrolytes Phil. Mag. (5) 48 p. 474 (1899)

p. 529 Krafft [illegible] colloid. [illegible] Ber. d. ch. Ges. 32 p. 1584 (1899) (Verfeinerung

[illegible] Krystallisations [illegible] ,, p. 1596 ,,

p. 1608

---

p. 650 **Vriens** Z. ph. Ch. [illegible] & Adsorption 31 p. 280 (1899)

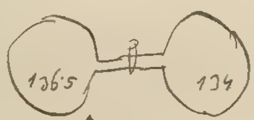
Concentrations [illegible] $\frac{1}{100}$ [illegible] HNO_3 [illegible] Filtrieren

p. 653 Stark [illegible] Pseudofällung [illegible] Flocken [illegible] Wied. Ann. 68 p. 117 (1899)

Wied. Ann. 37 (1889) p. 341

Natanson [illegible] Wärmeänderung bei d. Ausdehnung d. Gase

Joule's Versuch: [illegible]



2828 [illegible] 0

$-2.360°$ F. $+2.38°$

$+.031°$

[illegible]

Erklärung [illegible] Gesetz.

[illegible] $\begin{array}{l} v \,..\, dv \\ \theta \,..\, d\theta \end{array}$ $\frac{2N}{\alpha^3\sqrt{\pi}}\, v^2 e^{-\left(\frac{v}{\alpha}\right)^2} \sin\theta \, dv\, d\theta$

[illegible] $\int \frac{N v \tau \cos\theta}{V} \frac{2N}{\alpha^3\sqrt{\pi}} v^2 e^{-\frac{v^2}{\alpha^2}} \sin\theta\, dv\, d\theta$

$= \frac{S\tau}{V} \frac{N\alpha}{2\sqrt{\pi}}$

[illegible] $\begin{array}{l} v \\ \theta \,-- \end{array}$ $\frac{4}{\alpha^4} v^3 e^{-\frac{v^2}{\alpha^2}} \sin\theta \cos\theta \, dv\, d\theta$

[illegible] .. $\frac{2}{\alpha^3\sqrt{\pi}} v^2 e^{-\frac{v^2}{\alpha^2}} \sin\theta\, dv\, d\theta$

[illegible] $\overline{v^2} = \frac{3}{2}\alpha^2$ [illegible] $T \doteq \frac{4}{3} T_0$

[illegible] $= 2\alpha^2$

Wenn alles wärme isolation ist so [illegible] adiabat [illegible] temp. [illegible]

[illegible] isotherm [illegible]

[illegible] Wärmeleit[illegible] Colorimeter [illegible]

[illegible] Effusion (Dimensionen [illegible])

Kritik: halte diese Überlegung für sämmtlich falsch!

da sie sich auf das für ruhendes Gas geltende Vertheilungsgesetz stützt

Es müsste vor Allem die Störung bestimmt werden.! Innere Reibung hier gar nicht erwähnt!

Wied. Ann. 31, (1887) p 502 [illegible] CO_2 [illegible] || Siehe Phil. Mag. Sutherland 22 p. 81 (1886)!

Nach Methode Thomson-Joule

Dessen früher Resultate [illegible]

$$\frac{\Delta T}{\Delta p} = 1{\cdot}18 + 0{\cdot}0126\, p_{at.} \qquad \text{bis zu 25 At.}$$

bei 20°

Folgt daraus für Zustandsgleichung:

$$p = \frac{RT}{v-b} - \frac{F(T)}{v^2} + T\,\varphi(v)$$

Um über F u φ zu entscheiden [illegible]

[illegible] V. d. W. [illegible] Werth [illegible] $\frac{2}{3}$ [illegible]

Z ph Ch. 19 p 228

Bredig Wärme[illegible] Ionen[illegible]

Höfker [illegible]

		K	λ [illegible]	Kationen[illegible] a
~~Dimethylamin~~	Äthylamin	58.4	46.9	46.8
~~Äthylamin~~	Dimethylamin	61.6	49.4	50.1
Trimethylamin	Propylamin	52.6	36.8	40.1
	Trimethylamin	57.1	40.0	~~[illegible]~~ 47.0
Amylamin		52.2	32.8	36.4
Diäthylamin		51.6	33.1	36.1
Dipropylamin		44.8	24.0	30.4
Triäthylamin		46.8	25.0	32.6

Im allg. [illegible] $K = 23.4 + 0.747\,a$

Z ph Ch. 19 p. 624

Kenrick Die Potentialsprünge zw. Gasen u. Flüssigkeiten

Lenard Wied. Ann. 46 p 584 ([illegible])

JJ Thomson Phil Mag 37 p 341 (1894) [illegible]

[illegible]

[illegible]

[illegible]

Kelvin Maclean, Galt Nature 51 p 495 (1895) [illegible]

Usener Dissert. Bonn [illegible] Lenard

Methode: Bichat Blondlot

1). [illegible] Pot [illegible] ([illegible]) [illegible]

[illegible]: [illegible], [illegible]

2). Pot. gr. Luft / norm KCl [illegible] [illegible] [= 0·1 γ]

3). Pot. gr. [illegible] diss. Subst. [illegible]

zB. norm HCl / norm KCl	0·021 V.	←
$\frac{1}{10}$ norm HCl / $\frac{1}{10}$ norm KCl	0·008	→
norm HCl // norm HNO_3	0·027	→
norm KCl / norm HNO_3	0·049	→
Na_2SO_4 / KOH	0·026	→
Na_2SO_4 / H_2SO_4	0·101	←

4). [illegible] (undiss.) [illegible] – diss. Subst. [illegible]

[illegible]

[illegible] 120 [illegible] : Oberfl. [illegible] : [H_2O γ = 7·57] ~~7·57~~

norm KCl [illegible] : γ = 7·86

Amylalk. i. norm. KCl	2·5 cm³ pro 1000 cm³ :	5·80
	5	5·07
	10	3·97
	20	3·01
	gesätt. 26	2·93
Buttersäure "	10	5·64
	20	4·76
	40	3·89
Äthylalk.	5	7·59
	15	7·16
Essigsäure "	5	7·59
	10	7·37
	15	7·21
Kampfer "	gesätt. cca $\frac{1}{1000}$	5·74
Äthylbenzoat "	4 Tr [= cca 0·07 cm³]	7·65
	8 [0·14]	7·35
	16 [0·28]	6·87

Potentialdifferenz:

Essigsäure	1 cm³, kcc	0·008
	3	0·020
	9·5	0·057
Amylalk.	0·25 / kcc	0·046
	1	0·165
	2	0·207
	3	0·223
	5	0·246
	10	0·265
	26	0·283

Äthylalk.	1	0·013
	5	0·052
	15	0·125
	17	0·144

Buttersäure 0·713 g. pro 1 cm³

1	0·078
1·4	0·107 ~~0·098~~
3	0·21

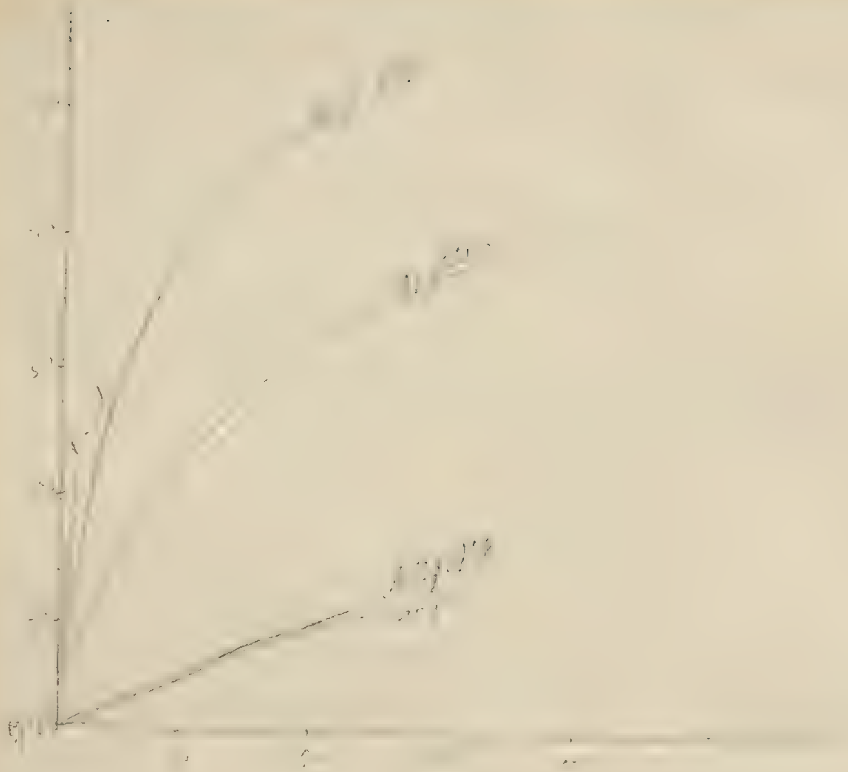
[bei Druckhöhe 28 cm [illegible] 0·038; 20: 0·027; 8: 0·016; 3: 0·008 [illegible]]

10.	0·301
20	0·33

Kampfer 1 0·54

Äthylurethan	5 g	0·25
	10	0·48
Äther (0·5/2)	1 cm³	·01
	10	0·3

[illegible]



Fortsch. d. Ch., 1900

Wien [illegible] Mechanik Arch. Neerl. (2) 5 p. 90–107 (1900)

p. 217 Bénard Tourbillons cellulaires Séance Soc. fr. phys. 1900 213–226 [illegible]

~~p. 219 [illegible] Compt. rend. [illegible] Wied. Ann. 109 p. 837 (1900)~~

~~[illegible]~~

p. 321 Spring Sur la floculation des milieux troubles

Rec. trav. chim. 19 p. 204 Chem. Centralblatt 1900, 2 p. 805

1). [illegible] c/2 „[illegible]" [illegible]

2). [illegible] 1:20 [illegible] Membranen; [illegible] hydrolyt. [illegible] Hydrat [illegible]

3). [illegible]

4). [illegible]

5). [illegible] Kath.

6). El. [illegible] Ion [illegible]

7). El. [illegible] Kathode [illegible] Anode [illegible]

8). [illegible] Elyte [illegible] Kathode [illegible] Ion [illegible]

Fortschr. d. Phys. 1899

Wetterstein Wied. Ann. 68 p. 441 (1899) Abweichg. v. Poiseuille [illegible]

Mie [illegible] Wien Ber. 107 p. 1113 (1898)

p. 175

Vanino colloid. Bi : 2g Bi tartarat [illegible] Weinsäure [illegible] KOH

[illegible] 600 cm³ [illegible] 1·5g Zinnchlorür [illegible] KOH [illegible]

[illegible] Bi [illegible]

Lottermoser colloid. [illegible] Ph. Z.S. 1 p. 148 (1899)

[illegible] 1 p. 285 : [illegible]

Kaolin [illegible] Eosin [illegible]

[illegible]

Ercolini Cim. 9 p. 110, 446 (1899) Wärmetönung [illegible] C, SiO_2 [illegible] H_2O

~~Akt~~, 1g C 14·23 cal

1g SiO_2 13·23

[illegible]

Lagergren p. 230 [illegible] Compression [illegible] 6150 at.

Schaum Ph. Z. 1 p. 5 (1899) [illegible] Krystalle

Ewing & Rosenhain The crystalline structure of metals Pr. R.S. 65 p. 172 (1899)

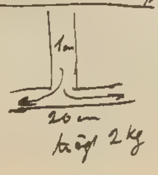
[illegible] Plastic [illegible]

[illegible] (Mikroskop [illegible])

Hauser C.R. 128 (p. 242 / p. 1112, 1899) Études sur la filtration

Hagenbach-Bischoff & R. Emden [illegible] N. v. Ph. 14 p. 565 (71 [illegible] 1899)

1)



4. [illegible]

Mstinsky J. phys. 9 p. 57 ... [illegible]

CO_2 5–40 Atm ... [illegible]

Maltenbach: ... 20 Wied. Ann. 67

S H Bryan Resistance of air Nature 61 p. 107

1 m² ... 1 m/sec ... : 81 g

... : 22.5 g

Segel Ph. Z. 1 p. 126 Elasticität weicher Körper

p. 501 E. Donnman (Nachwirkung & Torsion) ... Diss. 176 S. Groningen ...

Nawerking van Torsie en Lengte Dr... van dunne draden

Rayleigh Investig. in capillarity Phil. Mag. 48 p. 321

Fischer Wied. Ann. 68 p. 414 ... : $5 \cdot 10^{-6}$ mm

Donnan Natur d. Seifen Emulsion Z. ph. Ch. 31 p. 42 (1899)

Cl. Mils Randwinkel ... Ann. ... 14 p. 383 Randwinkel = 0!

Wolter Chem. Ztg. 23 p. 62 ergebnislose Versuche Salzlösungen ... durch Centrifugal Kraft zu concentrieren

Colloidale Lösungen:

Stoeckl u. Vanino: Z. ph. Ch. 30 p. 98 (1899)

Stark: Wied. Ann. 68 p. 618 p. 117

Whetham: Phil. Mag. 48 p. 474

Krafft: Ber. d. ch. Ges. 32 p. 1584 p. 1596, (p. 1608) ... ~~...~~ ...: Mol. ... = 1600 ... = 322 ...

Zsigmondy Ann. f ... 1 p. 276

Rothes Au ... als Strahlungsfilter: Kochen ... 15 mg $AuCl_3 \cdot HCl$ in 100 cm³

... alkalisch ... 2–4 cm³ ... 0.2 normalen K_2CO_3 ... 4 cm³ ...

Formaldehyd ... Vol. Dialysieren bis ... 0.12 % Au ...

Spring Bull. de Belg. p 174, p. 300 (1895)

[illegible] Cco [illegible]

[illegible] El. [illegible] Nicht el. [illegible]

Lamb & Wilson The conductivity of heat insulators Pr R S 65 p. 283 (1899)

Luft	0.000200
Fortm-Sägespäne 0.	242
Haarfilz	145
Asbest	287
Sand	740

Milner & Chattock Ph Mag 48 p. 46

thermal conduction of water : $\kappa = 0.001433$ (20°)

Rayleigh Phil Mag. 47 p 308, 314 Conduction of heat in air & propagation of sound

p 473 Heschus [illegible] J. r. phch Ges. 31 p 126 (1899)

Brillouin Théorie molec. des gaz. Ann chim phys 20 p 440 (1900)

— [illegible]!

Bellati Sul calore svolto nel bagnare le polveri Cim. 12 p 296 1900
Atti Veneto 59 p. 931

Fortschr 1900 II
II p. 241

Chappuis Wied Ann 19 p. 21 (1883) [illegible]

[illegible]

$p =$ [illegible]

Atom [illegible] 32.95   48.8

[illegible] 35 [illegible]

Sydney Young & Thomas [illegible]   270.5 $\rho_0 =$ 0.5 [illegible]

187.8°   [illegible]

$p\alpha =$ 32.89 [illegible]

Crit. Phys. [illegible]

[illegible] VI

[illegible] Normal [illegible]

[illegible] $\rho_0 =$ 0.[illegible]

k — 23[illegible] $p\alpha =$ 0.[illegible]

$p\alpha =$ 39.62

[illegible]

Normal [illegible]   5p [illegible] $\rho_0 =$ [illegible]

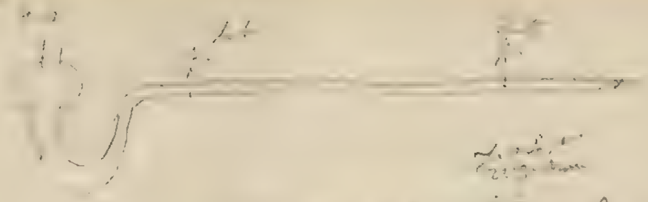
k — [illegible] $p\alpha =$ 33.[illegible]

$\rho\alpha =$ [illegible]

31.49

1 : 4.84 = 0.2 06

32



1	0·459 mm	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

$b =$ [illegible]

$b =$ [illegible] from [illegible] $\frac{1}{r^2}$

[illegible]

$LR = A\, r$ [illegible]

Tangential [illegible]

[illegible]

$\nu = C, 0,$

107, 1

66

OE Meyer Pogg. Ann. 127 p. 253, 353

Girardi's ... $V = \pi t \frac{p_1^2 - p_2^2}{2p} \frac{1}{8\eta l} \frac{2a^3b^3}{a^2b^2}$ Rathke C.R. 57 p. 320

Johannis Röhre C: $2R = 0.00539$ engl Zoll

$p_1 = 28''81$ $W_2 = 41.64$ Zoll^3 $l = 1''$

$p' = 29''32$ 21.16^3 $2''$

" " $4''$

Aus ... Rec... ...

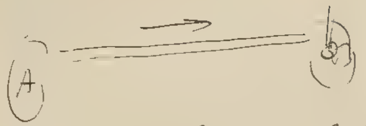
$\frac{1}{D} = \frac{\pi p_1 R^4}{8\eta}$

0.00539. 127
1078
2273
$\pi = 0.00069$

$\eta =$	$p_1 - p_2 =$ 28" 20"	12"	8"	4"	2"
0.000206 28/0	248"7				1270"5
177	211"5				1195"0
178	418"0				2436"

ψ ... 0.000177

0 B Duye Pyg. L   N 1



$V_A = 242.1\ cm^3$ $278.5\ cm^3$

II $l = 155.3$ Dvomp. A vord.

					ε
θ 14.85	p_1 = 142.51 cm	p_2 = 7.84	η = 0.001187		0.0362
		18.30			
7	132.20	26.78			359
65	123.45	34.53			363
55	116.08	41.41			371
55	109.73	46.36			367
je 2 Kronto 55	104.43	51.06			369
5	99.83	54.76			368
45	95.92	58.18			371
5	92.67				

A comp. B st

14.1	143.29	p_2 10.62		
25	133.24	21.17	0.0377	
4	124.06	30.09	376	η' = 184
6	116.60	37.62	377	
65	110.42	44.07	378	
6	105.02	49.38	379	
6	100.66	53.81	378	
6	96.84	57.56	378	

Quecksilber 0.001114

III $l = 153.7$ η = 0.001584   A st B st

20.0	140.58	5.65	
·2	122.08	25.80	178
7	109.18	37.04	
21.0	99.22	47.00	
0	94.12	55.94	

v. Helmholtz ... Crelle 75 p. 337

$$\rho \frac{du}{dt} = \eta \left\{ \frac{\partial^2 u}{\partial x^2} + \frac{\partial}{\omega \partial \omega}\left(\omega \frac{\partial u}{\partial \omega}\right) \right\} - \frac{\partial p}{\partial x}$$

$$\rho \frac{\partial \varrho}{\partial t} = \eta \left\{ \frac{\partial^2 \varrho}{\partial x^2} + \frac{\partial}{\partial \omega}\left(\frac{\partial(\omega \varrho)}{\omega \partial \omega}\right) \right\} - \frac{\partial p}{\partial \omega}$$

∂

$$u = \frac{\partial \varphi}{\partial x} + \frac{1}{\omega} \frac{\partial \psi}{\partial \omega}$$

gen. u v w constant

$$\varrho = \frac{\partial \varphi}{\partial \omega} - \frac{1}{\omega} \frac{\partial \psi}{\partial x}$$

Wied. Ann. 19 p. 857 Koch

I). $r = 0.0042456$ cm $l = 9.875$ cm

$p_1 = 25$ cm $- 969$ cm $p_2 = 2.4 - 1.1$ cm

II). $r = 0.00593$ cm $l = 19.22$

		p_1	p_2	T	t^0 temp.	μ
I).	1).	24.9	2.1	2623	301	0.000532
	11).	96.6	1.1	1027	371	643
						494
II).	1).	13.22	1.4	3317	273	
		113.1	0.7	1043	380	654

III). $r = 0.008238$ cm $l = 18.0$ cm ... ϑ_2 4%

Wiedem. Ann. 16

Loth. Meyer p. 394

Stendel p. 367

Capillare 1404 mm $= l$

0.333 mm $= 2r$

2ds Rith. Alk.

$p_0 = 75.96$ $t = 420$ $\eta = 0.000\,135$

$p_n = 8.44$

Abs. Alk.

$p_0 = 76.00$ $t = 390$ 142

$p_1 = 3.47$

Wied. Ann 23 p. 353 Schumann

$$\frac{\partial p}{\partial x} + \rho u \frac{\partial u}{\partial x} = \eta \frac{\partial}{r\,\partial r}\left(r \frac{\partial u}{\partial r}\right) \qquad \frac{\partial (\rho u)}{\partial x} = 0 = \rho \frac{\partial u}{\partial x} + u \frac{\partial \rho}{\partial x}$$

$$\frac{\partial u}{\partial x} = -\frac{u}{\rho}\frac{\partial \rho}{\partial x}$$

$$\frac{\partial p}{\partial x} - u^2 \frac{\partial \rho}{\partial x} =$$

$$K p = \rho$$

$$\frac{\partial \rho}{\partial x} = K \frac{\partial p}{\partial x}$$

$$\rho \frac{\partial p}{\partial x}\left(1 - K u^2\right) = \eta \frac{\partial}{r\,\partial r}\left(r \frac{\partial (\rho u)}{\partial r}\right)$$

$$M = \frac{\pi R^4 K}{16 \eta l}\left(p_1^2 - p_2^2\right)\left(1 - K u^2\right)$$

$$u^2 = K\left(\frac{R^2}{8\eta l}\right)^2 \left(p_1 - p_2\right)^2$$

$l = 14.04$ $R = 0.01664$

$p_1 - p_2 = 73$

$K u^2 = 0.006\,112$ $= 2.08\%$

[$\eta = 0.000180$

Schumann $\quad 168$]

0.0333

η, 1^2 $\circ$ / Öl.

$$M = \frac{\pi R^4}{8\eta l}\int_{p_u}^{p_o} \rho\, dp$$

Friction ist = [illegible] $\eta = \frac{1.017}{1.021}$ $\frac{\pi R^4 (\ldots)}{\ldots}$

[illegible] 0·4 %

Schwingende Scheibe:

Grossmann p. 019 } Wied. Ann. 16 (1882)
Schmidt p. 633 }

Strouhal p. 216 Wied. Ann. 5 (1878) & [illegible]

~~[illegible]~~ at Rotation [illegible] cylinder

D = [illegible] cylinder $\overline{D}$ = Abstand & Rot. [illegible] ca 0·35 mm

---

D = 8·51 mm	V = 9·36 $\frac{m}{sec}$	N = 208	$\frac{N}{V}$ = 22·2	$\frac{N}{V}D$ = 189 = constant
3·254	8·55	521	60·9	199
	10·20	625	61·3	
				194
1·658	4·62	521	112·8	185
	5·58	626	112·2	
	7·45	834	112·0	
	9·27	1042	112·4	190
0·960	5·07	1001	197	
	6·74	1334	198	190
	8·37	1668	199	
	11·16	2224	199	167
0·638	6·05	1668	276	
	7·36	2085	283	180
	8·91	2502	281	
	11·75	3336	290	188
0·394	7·50	3336	445	175
0·385	7·28	3336	458	176

$t = 9{\cdot}5$: $D = 0{\cdot}393$ mm $V = 2{\cdot}37$ $\frac{N}{V} = 345$

$4{\cdot}25$ 412

$t = 37^\circ$: $V = 2{\cdot}60$ 326

$3{\cdot}54$ 366

$t = 11^\circ$ $D = 0{\cdot}179$ $V = 3{\cdot}14$ 613

$5{\cdot}07$ 734

37° $3{\cdot}81$ 648

$4{\cdot}98$ 692

[illegible] temp [illegible]

[illegible] [$V^{[illegible]}$ Resonanz [illegible]] [illegible]

[illegible]:

$D =$ ~~0·000~~ 179 231 206 327 ~~386 394 499~~

[illegible] $N = \frac{c}{D}\left[V - f(V)\right]$. [illegible] $f(V)$ [illegible]

Low Windst[illegible] 52 [illegible].

[illegible] (Kundt's Kayser)

Kirchhoff's [illegible]: $v = a\left(1 - \frac{\gamma}{2r\sqrt{\pi n}}\right)$ $a =$ [illegible]

$\gamma =$ const [illegible]

[illegible]

	Röhre I $r = 14$ mm	III $r = 4{\cdot}675$ mm
$a = 330{\cdot}58$ $v =$	$n = 256$: $327{\cdot}29$	$320{\cdot}00$
$v =$	$n = 1023{\cdot}25$: $328{\cdot}68$	$325{\cdot}29$

[illegible]

$\gamma = \sqrt{k} + (\sqrt{k} - \frac{1}{\sqrt{k}}) \sqrt{\mu}$ berechnet 2 0·00742
beobachtet 8 0·007989

$k/k' \; 8 = 1·3947$

$CO_2 \; 8) \; \gamma = 0·004577$ ($k = 1·2883$) $\quad a = 257·03$

~~12265~~

H_2

Kirchhoff Pogg. Ann. 134 p. 177 (1868)

Helmh. Gleichungen:

$$\frac{1}{\rho}\frac{\partial \rho}{\partial t} + \operatorname{div} = 0$$

$$\frac{\partial u}{\partial t} + \frac{1}{\rho}\frac{\partial p}{\partial x} = \mu' \Delta u - \mu'' \frac{1}{\rho} \frac{\partial^2 \rho}{\partial x \partial t}$$

$$\frac{p}{\rho} = \frac{p_0}{\rho_0}(1 + \alpha \vartheta)$$

$$\kappa \, \Delta \vartheta = \frac{1}{\alpha p_0}\left[c \rho \frac{\partial p}{\partial t} - c' p \frac{\partial \rho}{\partial t}\right]$$

$$dp = \frac{p_0}{\rho_0} d\rho + \alpha p_0 d\vartheta$$

$\rho = \rho_0 (1 + \sigma) \qquad \vartheta = \frac{c' - c'}{\alpha c} \theta \qquad k = \nu c \rho_0 \qquad \frac{p_0}{\rho_0} \frac{c'}{c} = a^2 \qquad \frac{p_0}{\rho_0} = b^2$

$$\frac{\partial \sigma}{\partial t} + \operatorname{div} = 0$$

$$\frac{\partial u}{\partial t} + b^2 \frac{\partial \sigma}{\partial x} + (a^2 - b^2) \frac{\partial \theta}{\partial x} = \mu' \Delta u - \mu'' \frac{\partial^2 \sigma}{\partial x \partial t}$$

$$\frac{\partial \theta}{\partial t} - \frac{\partial \sigma}{\partial t} = \nu \Delta \theta$$

$$\gamma = \sqrt{\mu'} + \left(\frac{a}{b} - \frac{b}{a}\right)\sqrt{\nu}$$

$\sigma \rho \; e$ [illegible] e^{ht}

C Neumann [illegible]

[illegible]

Saxén Wied. Ann. 47 (1893) p. 46

Helmh.	$U = \frac{\epsilon J}{4\pi k^2}(\varphi_1 - \varphi_0)$	$V = \frac{\epsilon P}{4\pi k^2}(\varphi_1 - \varphi_0)$	$\} = \frac{U}{J} = \frac{V}{P}$
Lamb	$U = \frac{\epsilon J}{4\pi k^2}\frac{l}{d}E$	$V = \frac{\epsilon P}{4\pi k^2}\frac{l}{d}E$	$\}$

Concentr. [illegible]
Quincke 110 p 61
Wegmann 24 p 600 (1856)

Lend.

[illegible] $CuCl_2$

Dorn Wied. Ann. 9 [illegible] $CuCl_2$

Tereschin Wied. Ann. 32 p. 1887 p. 333 [illegible]

	H_2O,	Aethyl. Alk.	Am. Alk.	
p [illegible]	4722	6365	23350	$\cdot 10^6$ (Hg = 1)

// c_p [illegible] > ∞ 1·3 (C55)

Siehe Quincke 28 p 547 (1886)

[illegible]

$\epsilon = \frac{1.9}{300} \cdot \frac{\text{[illegible]}}{\text{[illegible]}}$ [illegible] constant

0·0000536
0· 244
0· 165
(C55)

[illegible] Quincke
— 55 – 67

34

Coehn 64 p 217 (1898)

Heydweiller 66 p. 535 (1898)

[illegible]

[illegible] 120.81 [illegible]

[illegible]

[illegible]

Töpler Gleitfunken [illegible] 60 p. 1061

Cohn p. 1191 Replik [illegible]

Mach 68 p. 182 [illegible]

~~Holtz~~ 2 p. 1

Kötschau 26 p. 537

Reuss 110 p. 309

Stark Pseudo[illegible] 68 p. 117

Heydweiller [illegible] 69 p. 531 Graetz 1 p. 530

Wien [illegible] 62 p.

Braun 59 p. 673 [illegible] Oberfläche [illegible]

Roever 57 p. 397 [illegible] Endosmose [illegible]

Oberbeck 56 [illegible]

[illegible] [illegible] [illegible] [illegible] 21

~~Reinganum~~

Humphreys & Mohler

Astroph. J. 3 p. 114 (1896)
4 175 "
4 249 " Rep. Br. Ass 1897 p. 556
6 169 (1897)

Phil. Mag. 44 p. 119 (1897)

Huff Astroph. J. 14 p. 41 (1901)

Schuster " 3 p. 292 (1896) [illegible]

Fitzgerald " 5 210 (1897)

Humphreys 6 184

Kundt Pogg. Ann. Jubelb. p. 615 (1874)

Wolsing Astroph. J. 7 p. 317 (1898) [illegible]

~~Beibl.~~ 23 (1899) p. 547

Boltzmann Zittingsversl. Ak. Wet. Amsterdam 1898/99 p. 477

$$p + \frac{a}{v^2} = RT\left[\frac{1}{v} + \frac{b}{v^2} + \frac{5}{8}\frac{b^2}{v^3} + \left(\frac{1283}{8960} + \frac{3\beta}{2}\right)\frac{b^3}{v^4}\right]$$

$\beta = 0.0958$

mit [illegible] [illegible] [illegible] van Laar

Zittingsversl. p. 350 [illegible] 4.73

Jäger Wien. Ber. 108 p. 447 (1899)
II 109 p. 74 (1900)

$y = y_0 \left(1 + \frac{2b}{2v}\right)$

$y = y_0 \left(A + \frac{4b}{v}\right)$

$y = y_0 \left(1 + \frac{11}{2} \frac{b}{v}\right)$

Van Laar Versl. 1901 p. 506

Correction of $b = f(v)$

Diffusion ... ; ... p. 11

Mache ... Wien Ber. 110 p. 176 (1901)

Kamerlingh Onnes Versl. Ak. Wet. 1901/902 p. 136 Beibl. 1902

$pv = A + \frac{B}{v} + \frac{C}{v^2} + \frac{D}{v^4} \dots$ Dichtung, ...

Edser Wied. Ann. 9 p. 717

V. d. W. Continuität Deutsch 81 p. innerer Druck

Äther 1300–1430 H_2O: 10500–10700

Alk. 2100–2400 atm CO_2: 2820

Wied. Beibl. 21 p. 400:

H. A. Lorentz Entropie einer Dissmasse Zittingsversl. Kon. Inst. 1896/97 p. 252–261

Z. Phys. Chem. I p. 593. (1897)

Hydromechanique Fortschr. 1902 Inhalt!!!
Vol 58

Register 21–43 : 1897

Rosenberger Gesch. d. Phys. [illegible] Griesbach Prog.

Rob. Brown 1827 Botaniker Ann. Phys. u. Ch. XIV (1828) p. 294 [illegible] Molecül

Muncke [illegible] " XVII (1829) p. 160

Wiener: " CXVIII (1863) p. 79 [illegible]

[illegible]

Exner² CXXXVIII (1869) p. 323, Van d. Mensbrugghe CXLVI (1872) p. 623 [illegible]

[illegible] Molecül [illegible]

[illegible]

Gouy Note sur le mouv. Br. J. d. Ph. 1888 (2) T. 8 p. 561, C.R. 1889 T. 109 p. 102

O. Lehmann Molec. Physik Leipzig Engelmann 1888 Bd. 1 p. 264

Zeitschr. f. Krystallographie 1885 Bd. 10 p. 334 [illegible] !

[illegible] Griesbach [illegible] Anilin [illegible] Ölsäure

[illegible]

N6

Lobry de Bruyn Rec. trav. Chim. d. P.B. 19, p. 251 [illegible] coll. Susp. [illegible] opt., kryst. [illegible]

[illegible]: $0'5 - 1'0 \cdot 10^{-6}$ cm

F 1

~~Regnauld J. d. pharm. (3) 34 p. 141 (1857)~~

Sohncke Wied. Ann. 58 p. 417 (1896)

~~Jevons Pr. Manch. Soc. 9 p. 78 (1869)~~

Dancer " " 9 p. 82

E 11

~~Maltézos C.R. 121 p. 303 (1895)~~ (0 7.50)

~~Bliss Phys. Rev. (1895)~~

(1872) Mensbrugghe W. Ann. 146 p. 623

Spring ~~Rec. tr. chim. 19 p. 204~~ Chem. Centr. Bl. 1900, 2 p. 805

(Φ 311)

Renard Jahresber. f. Chemie 60 (1874)

~~L. Exner 56 Wien. Ber. (2) p. 116 (1867)~~

Naumann Thermochemie 1882 p. 30

~~Cantoni Nuovo Cimento 27 p. 156 (1867) Rend. Lomb. (2) 22 (1889)~~

Bodaszewski Chemisches Centralblatt (3) 12 p. 209 (1881)

Cosmos 7 p. 177 (1882)

C 7.30 N x 130

~~Meade Bache Pr. Am. Phil. Soc.~~

Nägeli Münch. Sitzber. 1879 p. 389

Nägeli Münch. Ber. p. 389 (1879)

G 71

Quincke Drude Ann. 1898

Kolacek ~~F 6 43 [illegible] 1894~~

[illegible] Cz:

Arnold Wiedem. 24 p. 27, 569 (1885), 32 p. 171 (1887), Reynolds Nature 30 p. 88 (1884)

Marey Journ. Ph. 1902 (p. 129) (Rauchfäden, [illegible])

A. Humphreys & Abbot 1851–1861 [illegible] Cz [illegible]: [illegible] Curve [illegible] Parabel

[illegible] 0·317 [illegible]

Hagen Berl. Ak. 1868 [illegible] Cz: [illegible] $v = 2{\cdot}425 \sqrt{\frac{F}{u}} \sqrt[6]{\text{Gefälle}}$ [illegible]

Graeve Civilingen. XXV p. 173 (1879) [illegible] Klein IX p. 28 (1881): 1877:

Oder [illegible] Warthe [illegible]

Welmbach (1855) Experim. Hydraulik [illegible] Freiburg

Wartmg 1867 Pogg. Ann. CXL p. 367 [illegible]

[illegible] 20!

Unwin Pr. R. S. XXXI p. 54 (1880) [illegible]

Volpicelli CR [illegible] XXIII p. 492 (1871) Temp. [illegible] Cz [illegible] — Thermosäule

Dufour ~~Pogg. Ann. CXLVIII (1873) p. 302~~ Temp. [illegible] Diffusion [illegible]

Arch. sc. ph. n. (1872); [illegible] (1874) p. 10

~~[illegible]~~

Feddersen Pogg. Ann. CXLVIII (1873) p. 302

C. Neumann Sächs. Ges. d. Wiss. (1872) p. 49

O. Reynolds Pr. R. S. XXVIII p. 304 (1879) XXX p. 300 (1880)

[illegible] – Temp. [illegible] $\frac{520°}{212°}$ F [illegible]: 1 Zoll [illegible]

[illegible] $\sqrt{H_2}$

[illegible]

Ch. Soret Arch. sc. ph. nat.(3) I p. 48 (1879), IV p. 209 (1880)

[illegible] 78° [illegible] 15–180 [illegible] [illegible]

C. Ludwig. Wien Ber. XX (1856) p. 539 : 2 [illegible] 8.98 % Na_2SO_4

[illegible] 4.31 %

<u>Plasticität:</u>

Tresca CR: LIX p. 754 (1864), LX p. 398 (1865), LXIV p. 809 (1867)

[illegible] 12000 kg [illegible]

XCVII p. 928 (1883); XCIX p. 104 (1884)

Spring Bull. Belg. (3) XLIX p. 323 (1880), Bull. VII p. 752, VIII p. 103

(3) VI p. 507 (1883)

<u>Diffusion</u> [illegible] : Longuet Bull Belg XV p. 297 (1848) Compt. rend. XXVIII p. 287

H_2 [illegible] Papier, [illegible]

[illegible] CR [illegible]

Winkelm. II b p 198

34 p. 499 (1892)
44 p 48 (1897)
12 p 81 (1881)

$J = J_0 e^{-\frac{\kappa l}{\lambda^4}}$

Trübe Medien:

Rayleigh Phil. Mag. 1885 p 443, Strutt: Phil mag 41 p. 107, 274, 447 (1871)

Chwolson Rep. Ex. 23 p. 139, 211 (1878), 26 p. 364, 385 (1890)

Clausius Pogg Ann 72 p 108, 298 (1847); 76 p 161 (1849); 88 p 543 (1853)

Crelle: 34, 36

$i = J_0 e^{-\frac{\kappa l}{\lambda^2}}$

Lampa Ph M 34 (1892) p 144 Wien Ber.

Angström Wied Ann 36 p 715 (1889)

Abney & Festing Pr R.S. 40 p 378 (1880)

Rayleigh On the scattering of light by small particles Ph M (3) 13 p 81

Spring Bull. Ac. Belg. 37 p. 174 (1899) p 483 (1900)

Tyndall Arch. d. sc. ph. et nat. 34 p. 168 (1869)

Aeuther Denkschr. Wien 73 (1901)

Trabert MZ 10 p ~~[illegible]~~ 245

Abney MZ 10 p 427

Günther p 101, 265 Arrhenius p. 854

Tyndall Phil Mag 38 p 156 (1870) 37 p 385

Rayleigh Phil Mag 34 p 499 (1892) 44 p 48 (1897)

Schiffswellen, Wellen &c:

Mitchell Ph M 45 (1898)

Lamb 403, 375

Froude Trans. Inst Nav. Archit. XVII (1877)

" " " " " XXII (1881)

Rep Brit. Ass. 1872 p. 118 Exp on the surface friction by a Plane moving th. water

Hütte p 406

White: Manual of Naval Architecture (1894)

Helmholtz Berl Ber 1889 p 761 = Wiss Abh 3 p 309

Discontinuierliche fl.:

Helmholtz Berl. Ber. 1868 p 215

Kirchhoff Crelle 70 (1869) p 289

Rayleigh Ph M. 5 (1876) p. 430

Kelvin Nature 50 (1894) p 574

Marey C.R. 122 (1901) p. 1291

Altmann Z. f. Luftsch. 29 (1900) p. 147

Vieille CR 130 p. 235 (1900)

√ E6 ↑

Thlsen Ann. 26 (1885) p. 314

Riecke Ann 10 (1880) p. 677

Victoria [illegible] 18[illegible]

[illegible]: [illegible] 118 [illegible] 85 [illegible]

133 [illegible] 22 [illegible]

[illegible] 1492

[illegible] 33 [illegible]

[illegible] 21 [illegible] = 5 [illegible]

Oceanic [illegible]

[illegible]

34 0[illegible]

335 [illegible] 4 [illegible] 15

[illegible]

1901 [illegible] 2237 [illegible] 3 [illegible] t

1901 [illegible] t

[illegible] 90 22 [illegible] 11

2-450

King Edward Turbine

King [illegible]	20[illegible]	20[illegible]	15 [illegible]
	20[illegible]	1[illegible]	6 [illegible]
	1[illegible]	[illegible]	600 I [illegible] 520
	14[illegible]	16.000 t.	300 II
	[illegible]	[illegible]	700 III
	21 [illegible]	2[illegible]	

[illegible] 3 [illegible]

[illegible]

[illegible] 10 [illegible] 18 [illegible]

[illegible] 2 [illegible] Kanal [illegible]

Canal [illegible] 40 [illegible]

[illegible]

[illegible] 3 [illegible] à 16000 [illegible]

[illegible] 31 [illegible]

[illegible] 19 [illegible] 3 [illegible]

2 [illegible] 5 [illegible] Holland [illegible]

19 [illegible] 460 t.

[illegible] 68 [illegible] 50 [illegible]

[illegible]

Holland 75 t : [illegible]

L 22'5 [illegible] pro Stunde – 6 [illegible]

[illegible]

– 2 1/2 h [illegible]

[illegible]

[illegible]

[illegible]

[illegible]
[illegible]
[illegible]

[illegible]
[illegible]
[illegible]

[illegible]

Brown : [illegible]

[illegible]

[illegible]

[illegible] 0.0010 [illegible]

[illegible] Temp 13°

[illegible]

[illegible]

[illegible] 0·0016 – 0·0039 [illegible]

0·0023

[illegible]

[illegible]

[illegible]

[illegible]

Menbrugghe 136 p. [illegible] ([illegible]) [illegible] capillaire [illegible]

" 146 p. 623 (1872) [illegible] Alk. [illegible]

[illegible] Benzin, CS_2, [illegible]

[illegible] Alk. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]
[illegible] CR. 133 p. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] p. 346–356 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Centra[illegible] [illegible] Z. p. 38, [illegible]

[illegible]

— [illegible] [illegible] T; [illegible] 1901

[illegible]

[illegible]

Drimer

Grabowski L. [illegible] Wien [illegible] 1903 [illegible] (1901)

Corn[illegible]-Zen[illegible] [illegible]

ang[illegible] [illegible]

[illegible] T[illegible]

Zu[illegible]ski J. D. [illegible]

Igd[illegible]ski ?

Kal[illegible] [illegible] 2 [illegible] J. [illegible]

[illegible] I [illegible]

?

[illegible] ✓ [illegible] Z. [illegible]

[illegible] Ph.M. [illegible] p. 535–540 (1901)

Winkler [illegible]

[illegible] 30 p. 80–86 [illegible]

[illegible]

Ni_2O_3

Zn 1·6–1·7 ✓

[illegible]

Cu

Ag_2O_2 [illegible]

0·8 ✓

1) Zn – [illegible]

[illegible]

Zs [illegible] 30 p. 145–250 [illegible]

[illegible] Chem [illegible] 6 p. 61 [illegible] 225

V. Czap[illegible]

C[illegible] 15 [illegible]

[illegible]

Dumont [illegible] 3 p. [illegible]

Zs [illegible] 5, 101–1[illegible]

J [illegible]

$$N = 0{,}548$$

$$\vartheta_2 = \left(\frac{T\,n_1}{n_2}\right)^2 \qquad \tau_{22} =$$

$$\rho = \rho_0 \qquad \gamma = \frac{\lambda}{\rho c^2}$$

[illegible] 11 p. 474

8°10	$\Delta = 0{,}08\,\%$	$\Delta = 0{,}33\,\%$	10mm – 760mm	?
107°69	$0{,}2\,\%$	$0{,}80\,\%$		

Oberbeck Wied. Ann. 56 p. 397 (1895)

[illegible]

$$\ldots = v \rho c \frac{\partial \vartheta}{\partial t} \qquad \vartheta = \ldots e^{\ldots}$$

$$-Q = \ldots = \frac{\vartheta_1 \, l \, v \rho c}{\ldots}$$

[illegible]

Temp. Öl. CS_2 – [illegible]

Oberbeck Wied. Ann. 11 p. 1038 ( ) [illegible]

[illegible] Wärmeleit. [illegible]

2 Cylinder [illegible]

[illegible] Convectionsströme [illegible]

prop. : $\frac{\alpha^2 \rho_0^{4} c^2 \vartheta^2}{\lambda \ldots}$ α = [illegible]

[illegible]

Alk. 1801 Luft 0·0130

[illegible]

Oberbeck Wied. Ann. 11 p. 489 [illegible]

[illegible] : 1) $\Delta \vartheta = 0$ 2) $\Delta u = \frac{\partial p}{\partial x}$ $\Delta v = \frac{\partial p}{\partial y}$ $\Delta w = \frac{\partial p}{\partial z} - \ldots \vartheta$

3) $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$ $[p = \frac{p_0}{\ldots}]$

[illegible]

[illegible]

Boussinesq Pouvoir refroidissant d'un courant liquide ou gazeux p. 71

J. d. Ph. (1902) Mise en équation des phénomènes de convection calorifique et aperçu sur le pouvoir refroidissant des fluides p. 65

$$\text{I.}\ \frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0 \qquad \text{II.}\ \frac{1}{\rho}\frac{\partial P}{\partial x}=-\frac{du}{dt} \qquad \frac{1}{\rho}\frac{\partial P}{\partial y}=-\frac{dv}{dt} \qquad \frac{1}{\rho}\frac{\partial P}{\partial z}=g\theta-\frac{dw}{dt}$$

$$\text{III.}\ u\frac{\partial\theta}{\partial x}+v\frac{\partial\theta}{\partial y}+w\frac{\partial\theta}{\partial z}=\frac{K}{C}\left(\frac{\partial^2\theta}{\partial x^2}+\frac{\partial^2\theta}{\partial y^2}+\frac{\partial^2\theta}{\partial z^2}\right)$$

xyz ... $\xi\eta\zeta$ $\qquad \xi=\sqrt[3]{\frac{a g C^2}{K^2}}\,x \qquad \theta=a\Theta \qquad u=\sqrt[3]{\frac{a g K}{C}}\cdot U$

θ — Θ

uvw ... UVW

P ... Π $\qquad \eta=y\sqrt[3]{\frac{a g C^2}{K^2}} \qquad P=\Pi\rho\sqrt[3]{\frac{a g K}{C}}$

a = température de la surface $\qquad \zeta=$ ....

à la surface: $\lambda u+\mu v+\nu w=0$

$\text{I}\ \frac{\partial U}{\partial\xi}+\dots=0 \qquad \text{III.}\ U\frac{\partial\Theta}{\partial\xi}+\dots=\frac{\partial^2\Theta}{\partial\xi^2}+\frac{\partial^2\Theta}{\partial\eta^2}+\frac{\partial^2\Theta}{\partial\zeta^2}$

$\text{II}\ \frac{\partial\Pi}{\partial\xi}=-\frac{dU}{dt}$ .... $\qquad$ à la surface: $\Theta=1$

---

h. f. $\sqrt[3]{\frac{a g C^2}{K^2}}=n \qquad \sqrt[3]{\frac{a g K}{C}}=m \qquad h=a$

$$n^2 K\frac{\partial\theta}{\partial x}=\frac{Ka}{\sqrt[3]{\frac{a g C^2}{K^2}}}=\cancel{\sqrt[3]{\frac{K^5 a^2}{g C^2}}}\qquad Ka\sqrt[3]{\frac{a g C^2}{K^2}}=\cancel{\sqrt[3]{a^4 g C^2}}\,K$$

$$K\left(\lambda\frac{\partial\theta}{\partial x}+\mu\frac{\partial\theta}{\partial y}+\dots\right)=Ka\sqrt[3]{\frac{K^2}{a g C^2}}\left[\lambda\frac{\partial\Theta}{\partial\xi}+\dots\right]=\underline{\underline{\sqrt[3]{K g C^2}\,a^{4/3}}}\left[\lambda\frac{\partial\Theta}{\partial\xi}+\dots\right]$$

etc.

Rayleigh Phil. Trans. CXCVI p. 206 (1901) J. d. Ph. 1 p. 122 (1902)

On a New Manometer & on the Law of Pressures of Gases between 1·5 and 0·01 mm of Hg. : H_2 ... O_2, A_2, N_2

... 0·002 mm!

V[illegible]

[illegible]

[illegible] $P_1 - P_0$ [illegible]

[illegible]

[illegible] la [illegible]

$$I_1 = I_0 \frac{2(1+\vartheta_0) - (m-1)(\vartheta_1 - \vartheta_0)}{2(1+\vartheta_0) + (m+1)(\vartheta_1 - \vartheta_0)}$$

[illegible] on [illegible] :

$$V = \sqrt{\frac{1}{\rho_0} \frac{P_0}{c} \left[c\,n + (m+1) \frac{P_1 - P_0}{P_0} \right]}$$

qui permet de calculer [illegible] de pression [illegible] de [illegible] avec la valeur V [illegible]

[illegible]

	[illegible]	[illegible] de propag. [illegible]	Δ
400	1·25	1·58	0·33
600	3·26	3·78	0·52
800	[illegible]	6·85	0·62
1000	10·15	10·81	[illegible]
[illegible]	15·01	15·64	[illegible]

Smirke 1829 112 p 359.

Gouy C. R. 109

[illegible] cont. temp. [illegible] 1:1000

[illegible]

Ref Koláček [illegible] radiometer [illegible]

Cantoni Rend. Ac. Lin 5 p 137 [illegible]

[illegible] Rend. R. Ist Lomb. 9 (1868)

Gouy J. d Phys (2) 7 p 561 (1888) / Result [illegible]

[illegible] Ramm [illegible]

[illegible]

[illegible] Ch. News 71 p. 67 [illegible]

[illegible]

Tanakadate & Aichi Nature 69 p. 79 (Nagaoka):

Constants of [illegible] Maxwell

$$A_1 = 2{\cdot}6595 \quad | \quad 2{\cdot}6512$$

$$A_2 = 1{\cdot}3682 \quad ; \quad 1{\cdot}3704$$

Natanson Phil Mag. 34 (1892) p. 51 On the probab. of molec. config.: N mol. in n elements

prob. of given arrangement: $\varphi = \dfrac{N!}{n^N N_1!\, N_2! \cdots N_n!}$; ratio of probab. of all being accumulated in one to all being uniformly distributed: $= \dfrac{1}{n^{N+\frac{1}{2}}} \sqrt{2\pi N}^{\,n-1}$

Lampa Phil M. 34 (1892) p. 144 Wiener Ber. [illegible] by turbid media: matter in water

cca $\frac{5\,gr}{100\,gr}$ Alk. — water good agreement with Rayleigh ; diameter less than ~~cca~~ 0·2 μ

Gustawicz Atlas globusa ziemi i nieba od najdaw. — Spr. III gimn. Krak.

Romer Wiatr } Kosmos

Wyprawy antarkt.

Mąkowski Podwodziemie wyspy gejsy i kratery

Rehman Czem są kiwanny i w jaki sposób powstały p. 169

Lorka Zf Trzęsienia ziemi w ... p. 282

Romer Fizyografia p. 187, 302, 409

Lorka Trzęsienia ziemi Wszechśw. 449, 468, 787

Cam Fizyogr.

~~Zawidzki Kras ...~~ Ch. p. 673

Świerz Pam. Tow. Tatrz. XVIII p 131 (1902)

Zawidzki Kras Krokodylowy Ch. p. 1225!

1902:

Gorczyński Promieniowanie słoneczne i atmosf. z. Wszechśw. XXI p. 161, 170

Centnerszwer Teorya jonów [illegible]

Prokopczyk O świeceniu podczas krystalizacyi Chem. Pol. II p. 169

Eichler Światło zwierzęcowe 4 lutego Wszechśw. XXI p. 108

Grabowski O obserw. fotom. Nowej Pers. Wiad. mat. VI p. 66

Romer Krytyka klimatologii Sreckiego " 112

Lárka O trzęsieniach ziemi w Polsce Kosmos XXVII p. 1

Gustawicz Z teoryi rzutów kartograf. Czasop. tech. XX p. 83

~~Żórawski~~

Dziewulski Rozwój pojęcia o ruchu w mechanice Przegl. fil. V p. 17

~~Dobrowolski~~

Chłapowski Życie i praca ks. J. Rogalińskiego Pozn. Tow. nauk XXVIII p. 113

Hoszyński Jonizacya gazów i rozkład. ciał Sprawozd. gimn. Chyrów | Przemyśl

Janiców Dyfuzya gazów i par Jarosł.

Natanson Inercyja i koercyja

Nowakowski Powstan. i zdarz. .... obj. Purkinjego - - Pamięt. akad. Krak. IV p. 49

Rotarski Kryształy ciekłe Chem. Pol. II p. 467

Ormiar O mechanizmie reakcyi " 601, 625

~~Słownik chemiczny Chem. pol~~

Chłapowski Nenki Pozn. Tow. n. XXVIII p. 185

Friedberg Woda jako czynnik geolog. Sprawozd. gimn. - Rzeszów p. 3

~~Koch Wied. Ann 19 p. 587 (1883)~~ 552

~~Lothr. Meyer " 25 p. 340 (1885)~~ 7

S Schumann 13 p. 1 (1881)

~~S Steudel 16 p. 368 (1882); 16 p. 394 (1882)~~

Schumann ~~23. p. 353 (1884)~~

Luftwiderstand: Thiesen Wied. Ann 26 p. 309 (1885)

Ausströmen d. Luft: Baille Journ. Phys. (2) 8 p. 29 (1889)

Koch Pogg. Ann 2 p. 39 (1823)

Reibungstöne Strouhal Wied. Ann 5 p. 216 (1878)

Kohlr 13 p. 545

Journal de Phys. 9 p 57 Akustische Erscheinungen der gaz

L. Mach Wien Sitzber. 106 II

Ob Dissip. Energie v. s. viel: Reynolds Phil. Trans. A 186 (1895)

—

Siehe Voigt Compendium etwas andere Ableitung

A. Oberbeck

Quincke Pogg. Ann. 113 p. 580 (1861) ...
107 p. 1 (1859)
110 p. 38 (1860) } Cu Cr

Hoza Clark Wied. Ann. 2 (1877)

Ségny C.R. Wied. p. 445 1899

Haton de la Goupillière ~~C.R.~~ 103 p. 661, ~~709 (1886)~~ 785, 925 ~~Cr – Cr –~~ ...

Rotatorische Strömungen:

Sprung

Roth Rep. Phys. 22 p. 354, 23 p. 1, 455, 553; 24 p. 90, 648 (1886–88)

Sutterby Ann. d. Phys. 1877 p. 258

Oberbeck Wied. Ann. 17 (1882) Berl. Ber. (1886) p. 383, 1129

Marchi Ö. Met. Z. 1884 p. 278

Helmholtz ~~Berl. Mon. Ber. 1873 p. 501~~; Wiss. Abh. I p. 158

Transpirations Methode: $0^\circ \quad \frac{L}{2R} \geqq 3000$

O. E. Meyer Pogg. Ann. 127 p. 253 (1866), 148 p. ... (1873)

Puluj Wien Ber. 69 1874, 70 (1874) $\Delta P = {120 \atop 70}$

Obermayer Carls Rep. 12 p. 13 (1876) $R = 0.138$ mm, $L = {56 \atop 95}$ cm

Breitenbach Wied. Ann. 67 p. 803 ... 5 1901

{Schultze ... Ann. d. Phys. 5 p. 140 (1901) $\eta_{15} = 1811 \cdot 10^{-7}$; $\{ p_2 = 30$ cm, $p_1 = 110$ cm; $\Delta p = 80$

~~Aus~~ Lang Wien Ber. 66 (1871)

Schalldämpfung d. innern Reibg. & Wärmeleitung: Maxwell Phil. Trans. (1879) p. 246; Neumann Leipzig Ber. d. k. sächs. Gesell. d. Wissensch. 1894 p. 19; Natanson Rozpr. XXVII p. 286; Kirchhoff Vorlesungen 1894 p. 154

Kirchhoff Pogg. Ann. 134 p. 177 (1868)

Schneebeli " 136 p. 296 (1869) Seebeck 139 p. 104 (1870)

Low Wied. Ann. 52 (1894) p. 652

Thomson-Joule Effect: Natanson: ~~37 p. 341 (1889)!~~

Natanson Wied. Ann. 31 p. 502 (1887); Schiller 40 p. 149 (1890)

Dissipation of Energy: bei internal friction Rayleigh Phil Mag 1893 Oct. p.

Stability of slow motion: Korteweg Phil Mag (5) 16 (1883) and ↑ p. 354 (and Lamb 537)

Effusion of Gases: Reynolds Phil Mag 1886 (5) 21 p. 185 adiabat theory

CR: 102 p. 1545, 103 p. 241 (1886) Hugoniot Ann Chim Phys. 1886 recalculation of experiments and of theory

Hirn Ann Chim Phys. 1886 VII (6) p. 289

Porosity Ann. Chim. Phys. 1896 VIII p. 1–79; 1897 XII p. 289–373 || C.R. 103 p. 125 (1886)

Emden Wied. Ann. 69 p. 264 (1899) Literatur!

Donnan Phil Mag 49 (1900) p. 423

Internal friction:

Stokes: On the Theories of the Internal Friction of Fluids in Motion Camb Trans VIII (1845)

On the Effect of the Inter. F.. — ...... on the Motion of Pend. " IX (1851) p. 58

Dissip. Function:

work done by friction

Rayleigh: Some General Theorems relating to Vibrations Pr. Lond. Math S. 4 p. 363 (1873)

O E Meyer J. f. Mathem. 75 (1873). 73 (1871) ? ~~78~~ 78 (1873) 80, 130

O E Meyer internal friction

Lorenz: Wied. Ann 13 pg. 582 (1881) Winkelm. I 2 p 289

~~Wszechświat p. 46 Ładuchi Utleni amin aromatycznych~~

Wiadom. mat. V (1901) p. 1-9 Gorczyński O stosowaniu wzorów dyspersyjnych
: Phys. Zeitschr. 1901 p. 205

p. 9 Kwiecki pomiar podróżny w Tatrach II 316 H. 444. ; II 317 H. 745

p. 141 Niewęgłowski o teorji momentów

p. 158 -178 Rudzki Ochłodzenie ziemi ... Sitzgsber. XLVI

p. 224 Zaradzki Notatka o zjawiskach krytycznych

Rozpr. 1901 p. 40 Bremer studja dynamiczne

Bernard ~~[illegible]~~ zapis Oświetlenie elektryczne 327 p. Warsz. 1901

W. Tołłoczko Fizyka. Kurs samokształcenia 485 p. W. 1901

F. Tomaszewski Promienie Röntgena
odb. ze sprawozd. dyrekcji. ck. gimnazjum w Samborze 79 p. 1901

Kenrick Zschr. 19 p. 625 (1896)

118

Kosmos XXVI p. 327, 474 Rudnicki O planach na stoisku

409 Sitko Kierunek i szybkość drgań według Hughes (czy nie w Wiad.?)
Prof. Z. 1900 od 1

~~436 Silberstein Elektrolit~~ przeczytane

~~174 Witkowski~~ uwagi o zasadzie ogólnych zasadach …

XXV p. 367 Ernst O indukcyjach w stał. bad. prąd. … elektrycznych

p. 36 Romer O … (czy nie głównie …?

Prace mat. fiz. XI :

XII p. 112 Smoluchowski

p. 220 Ernst Wzór interpolacyjny dla … przyrządu

p. 279 Jędrzejewicz Pomiary prądów podziemnych

Dickmann Kopernik 1900 (patrz Wiad. mat. V p. 94)

Wiadom. IV p. 69 - 90
Okres drgań …

~~Wiadomości mat. V (… 81)~~

~~z … Teorya dyspersyjna~~

Mercki ~~Pomiary~~ magnitudy

Dickmann Albertus de Brudzewo super Theoricas novas planetarum V p. 98

Silberstein Wstęp do … zjawisk elektrycznych

Kowalczyk O sposobach obliczania … V p. 245

Kronika polska: I p. 497 L. Ormuz O … przy …

513 ~~Szybkości …~~

585 Koelichen O zjaw. przyrod. w elektrolizie

561 Ormuz

… ostatnie …

9410
II

2 b

Klasa ....

Rok ....

Oddział ....

Półrocze ....

....

....

„LEOPOLIA" Pierwsza gal. fabryka bloków rys. i wyrobów papierowych we Lwowie.

~~J. J. Thomson Pr. C. Ph. S. 15 p. 465 Scattering of electrons~~

El. Osmose etc.

Cameron & Oettinger On E. m. F. prod. by acid & alc. sol. streaming thr. glass capill. Tubes

Ph. Mg. 18, 586, 1909

Gatecki Rorthory koloid. Kosmos 1909

Elektroendosmose, Strömungsströme Müller Pouillet IV I p. 614–620

Cotton-Rayl Ann. 30 p. 777 (1909) & quantit. 7 … / Dielectr.

Referat: Rapp. Congr. d. Ph. Christiansen & Lenz Elektr.

Fortschr. d. Ch. u. Ph. Ch. April 1911

Thomson Cond. d. El. p. 91 ?

Christiansen Kapillarelektr. Bewegungen

Ann. d. Ph. 12 p. 1072 (1903)

Capillarity:

Lewis On the Nature of the Transition Layer between two adjacent phases

Ph M 20 p 502 1910 . Surface density much greater than in latter

Ph M 20 p 665 1910

Kleemann On the Eq. of Continuity of the Liquid & Gaseous State of Matter

20 p. 135 (1910) , ~~p~~ 901, 905

Bakker Theory of Surface Forces

Sutherland 20 p. 249 Molecular & Electronic Potential Energy

Debye Zur Th. der Elektronen in Metallen 33 p 441

Happel Zur Th. d. Zustandsgleichung 33 p. 475

Sakkur Zur kin. Begründung d. Nernst' Wärme theorem 34 p 455

Happel Nullity Ann. 52 p 868

Opalescenz

Keesom, Einstein, Young Ph M 20, 793, 1910 . Kinetic theory

n O No & M ; de temp → ; 6 pressures θ

Jahrb. St. [illegible] : Bericht [illegible] (Schwd. [illegible])

Jahrb. d. R 6 p. 229

Rutherford & Royds J. d. R [illegible] [illegible]

[illegible] He [illegible]

$\alpha + 2 =$ He atom
(e_2 = 2 Elektronen)

E. Meyer Bericht [illegible] J. d. R 5 p 423 (1908)

Schweidler'sche [illegible]

prozentuale mittlere Schwankung $\bar{\varepsilon} = \frac{1}{\sqrt{Z}}$

$Z =$ [illegible] Atom [illegible] $Ne^{-\lambda t}$ [illegible]

[Aber dies nur falls Z grosse Zahl ist ?!]

Rutherf. & Geiger Pr. R.S., 81, 141, 1908

Regener Ber. Ber. 1909; 948

E. Meyer Struktur d. γ Strahlen J. d. R. 6 p 279

[illegible] Schwankung Anisotropie [illegible]

[illegible]

[illegible]

Report on Dolton Earthcurr. II   Z phys ch U XII p 371 ~~1899~~ (1900)

[illegible] Hypothesis [illegible]

[illegible]

[illegible]

[illegible]

[illegible] Dolton.

Paul Gerber Stargard

Kovarik Abs of β Rays Ph M. 849

Coeff of Abs. in cm of Al.

	Ra D	Th A	~~[illegible]~~ Ra B	Ra E	Act C	Th D	Ra C
	130	111·0	75·0	43·3	28·5	16·3	13·5
Hρ=		900	1200	1720	2150	2650	

Abs:
Hahn & Meitner Ph Z 9 p. 321 (1908)

W Wilson PRS 132, 612 (1909)

Schmidt J d R 4, 451 (1908) Ph Z. {10, 6, 1909; 10, 929, 1909 & [illegible] UrX Ra E; 8, 737, 1907}

Rutherf & Geiger Probability Variations in Distribution of α Particles Phil M

By scintillation 10,000 records number for ¼ or ⅛ min.

theory of Dr Bateman: if average number = x

probability for n = $\frac{x^n}{n!}e^{-x}$

good agreement

Bateman: Prob. of n particles striking in time t -- $W_n(t)$; λdt = prob. in time dt

The prob. of $(n+1)$ in time $t+dt$ = [prob. of n in t and one in dt] = $W_n(t)\,\lambda\,dt$

+ [prob. of $(n+1)$ in t and none in dt] = $W_{(n+1)}(t)\,[1-\lambda dt]$

$$W_{n+1}(t+dt) = (1-\lambda\,dt)\,W_{n+1}(t) + \lambda\,dt\,W_n(t)$$

limit:

$$\frac{dW_{n+1}}{dt} = \lambda\,(W_n - W_{n+1})$$

$$W_0 = e^{-\lambda t}\;;\quad W_n = \frac{(\lambda t)^n}{n!}\,e^{-\lambda t}$$

Kleeman

On the Shape of the Atom ~~Phil. Mag.~~ Ph. M. 20, 229 1910

bringt nichts auf

Traube Ph. Z. 10 p 667

Schon [illegible]!

Vol. d. Atome beim absol. Nullpunkt $\sim \Sigma \sqrt{\text{Atomgewicht}}$

Zahlenmaterial von Sutherland ~~Z~~ Z. ph. Ch. 32, 122 (1900) ihr Mol.-Vol. beim absol. Nullp.

Berthelot 35, 104 (1900)

dies in Übereinstimmung mit Bragg's Beobachtung Ph. M. 620 (1906):

d. stopping power $\sim \sqrt{A}$ resp $\Sigma \sqrt{A}$

für α rays für Ion

Somit $r^3_{\text{atom}} \sim \sqrt{A}$

also $r^2 \sim \sqrt[3]{A}$ also atomic cross section $\sim \sqrt[3]{A}$

Weiter O E Regel: p. 304 atoms lie in a plane $\therefore$ molecular cross section $\sim \Sigma \sqrt[3]{A}$

zeigt dass in der Tat $\dfrac{\varphi}{\Sigma \sqrt[3]{A}}$ recht konstant ist

---

further: speculations on density of atom ($\sim \sqrt{A}$)

attraction forces between atoms of the same order as $\rightarrow$ *) Ph. M. 1910 p 783

between atom and electron $\sim \dfrac{e^2 a^3}{r^5}$

Lenard Abs. v. Kath. Str. Ann. 12, 714, 1903

[illegible] / / H_2 [illegible] . Ann 56 p 258 (1895) $e^{-\alpha d}$

Nun spez. Abs. [illegible] $= a_0 \equiv \frac{a}{p}$

Erzeugg durch UVL

Fehlerquellen 1). sekundäre Str. [illegible] 11 V [illegible] Potent. [illegible] ([illegible]) [illegible]

2). Diffusion

3). diffuse Ausbreitg etc.

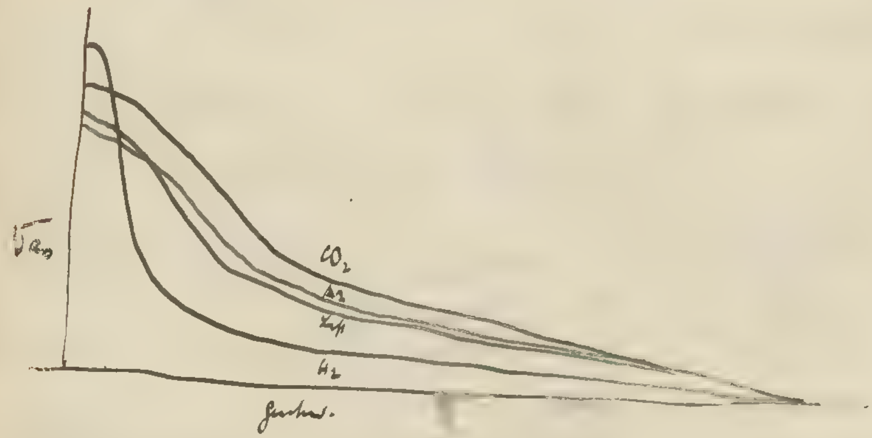
Volt	abs. Luft a_0	H_2	CO_2	A
4	31.4	46.5	38.8	26.1
8	28.33	42.6	29.8	25.8
		30 V. 14.16		35
60	26.7	8.9	33.5	31
100	19.41	5.83	27.5	26
500	9.04		11.36	6.6
1000	3.0	1.19	9.53	3.0
2000	1.59			
4000	1.20			1.92

dazu noch frühere Messungen für 30000 V. Ann 56 p 274, 1895

Durch Zeichnung ausgeglichene Werte. a_0 für 1mm Hg

V	Amplitude	H_2	Luft	A	CO_2
6	$\frac{1}{270}$	44	30	28	34
30	1/120	14·6	27	26	32
100	1/70	6·01	27	20	28
1000	1/20	1·2	3·9	4·2	7
4 000	1/10	0·19	0·85	1·3	2
30 000	1/3	0·00062	0·0050	–	0·0067
	Rechnungsstelle /3	0·000,000,6	0·000.009	0·000 01	0·000 01

nach Strutt



Theoretisches p 735

[illegible] Abs. a_0 [illegible] / [illegible] = 1cm² [illegible]

[illegible] Dynamik als elektr. Kraftfeld [illegible]

? [illegible] Dynamik (Elektr.) [illegible]

[illegible]

für H_2 muss [illegible] $< 0·000\,0006$ cm² für 1cm³ bei 1mm Hg

[illegible] H_2 [illegible] 13 cm² (0° [illegible])

17°C 1mm Hg

$\varphi = R^2\pi N$ [illegible] Zahl der Dynamiden [illegible] 1 H_2 atom

$\varrho = 2r^2\pi N z$!

$$\frac{\varrho}{\varphi} = \frac{2r^2 z}{R^2} < \frac{6.10^{-7}}{13}$$

[illegible] $z \geqq 1$ also $r < \underbrace{1{\cdot}5.10^{-4} R}_{0{\cdot}3\,.\,10^{-10}}$

> wenn [illegible] $z = 1000$
>
> $\frac{r^2}{R^2} < \frac{6.10^{-10}}{26} = \frac{1}{4}\,10^{-10}$
>
> $\frac{r}{R} < \frac{10^{-5}}{2}$
>
> $r < \frac{10^{-5}}{2} \cdot 2.10^{-8} = \underline{\underline{10^{-13}}}$! cm
>
> [illegible]

32

das wird man ansehen müssen [illegible] Abs. [illegible]

[illegible]

Dynamiden [illegible] ; [illegible] abs. [illegible] z.[illegible]

= [illegible]

englische Abs. [illegible] 1 Dyn. 2 Atom [illegible] 6

$$\text{[illegible]}\ \frac{\text{mol.vol.}}{\text{vol.}\ [\text{illegible}]}$$

= 6·0	1·0	0·7	1·2		$\underline{6^{0}}$
H_2	Luft	A	CO_2		

/ [illegible] $v = 0$ [illegible] mol. z.[illegible] abs. z.[illegible]

[illegible] mol. z.[illegible] :

	Mol. Quantität [illegible] Erste	Kathoden (6 Volt)
H_2	12·3	44
Luft	22·8	30
Ar	21·3	28
CO_2	33·5	34

← [illegible] H_2 mol. [illegible] 6°[illegible]

[illegible]

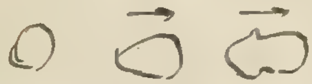
[illegible] Dynamiden d. neutral [illegible] = elektr. Doppelpunkt

[illegible] p 743

Becker Ann. 12, 124, 1903 & Leitfähigkeit fester Isolatoren $\int^2_{\beta\alpha}$ Ra Be.

Christiansen Ann 12, 1072 1903 & capillar elektr. Bewegungen

Deformationen rotierender Hg Tropfen in verd. Schwefelsäure d. d. CrO_3



Translation etc.

Schliessliche Absonderung fallender Tropfen f. d. Cr

J J Thomson On the Theory of Radiation Ph. M. 20 p 238, 1910

Referring to former paper Ph M $\left(\frac{14.\ p.\ 225}{1907}\right)$

radiation arising from impact of negative corpuscles with molecules

molecules built up of doublets repelling ~~the~~ the corp. with force $\frac{1}{r^3}$?

with − end pointing to the corpuscles ?

distance of charges would be $4 \cdot 10^{-9}$ cm

corpuscle circulating round AB doublet

steady motion if kin. en. ∝ frequency

explains Ladenburg exp. on ~~production~~ emission of el. by UVL

kin. en. ∝ frequency

factor $\frac{h'n}{2\pi}$ where h' = Planck's const.

See also Ph M 20 p. 544, 1910 !

Bragg Ph. M. 20, 385, 1910 The Consq. of the Corpusc. Theory of the γ & X Rays and the Range of the β Rays.

thinks X and γ rays = ~~corpuscles~~ negat. el. + + electr. neutralising charge but adding little to the mass !?

This easily explains following facts:

γ rays impinging on thin plate produce β rays on both sides but very much more on side of emergency; speed indep. of nature of atom, but dep. on nature of γ rays

likewise β rays produced by X rays depend much more on nature of these latter than on nature of atom (Beatty Pr. C. Ph. S. 15, 416, Sadler Ph. M. 1910)

Opposes strongly McClelland's view (Pr. R. S. 130, 501, 1908), supposing a real secondary radiation being added to real reflected one

no probability for specular reflection because:

1). stopping power of molecule for α rays = Σ stopping powers of atoms
Bragg Ph. M. April & Sept. 1907 for Ra C, Ra A

2). Abs. & scattering coeff. of liquid for β rays:
Schmidt Ph. Z. 11, 262 (1910), Crowther Ph. M. April 1910
additive principle

neighbouring atoms have no influence

Much more likely is the following explanation; chance of deflexion through any given angle represented by radii: „deflexion oval"

but only part emerging outside $\epsilon^{d \sec\theta}$

Ionisation probably = result of passage through molec., gradual drain of energy but no large change at any moment (?).

p. 395

Nothing compels us to handle electrons as anything more than centres of force (without dimensions)

think of β particles as possessing average range (weight of material crossed)

cylinder length d, crossection s ds = weight of cyl.

Madsen Ph M Dec. 1909 β particles of high speed traverse $\frac{1}{10}$ mm Al = 20 cm air without one deflexion

Crowther PRS 130 p 186 (1908) : β rays passing through 0.015 cm Al scattered in all dir. but still prevalence of normal direction

30% in a cone  } 4-5°

? whether γ and X rays ionize gases directly p. 397-408; thinks not, only by β's

---

Whole length of track of β rays in given material, irrespective of direction

ordinary absorption coeff of β rays = compound of d and the dimensions of the diffusion oval

·Kd Porter × true abs. coeff (Schmidt) = const except for tin

whole track of β particle in Pb > Al (weight for weight)

but they penetrate heavier Pb more than Al

in Pb β particles longer course but more ~~starting~~ turning points, end nearer beginning

J.J. Thomson Pr. C. Ph. S. 15 p 465 has published theory of the "scattering of the rapidly moving el. particles"

inapplicable because

1). + and − do not interfere ?

2). total defl. small, because defl. is the average of . .

as if grouped symmetrically about original direction

but from the beginning also large defl. must occur

3). loss of speed ?

Crowther Pr C Ph S 15 p. 442 shows abs. curves for Al & Pt

but only by chance Al fits Thomson's theory

conversion of form of rays; his own speculations about it

Kleeman Ph M. 20, 445 (1910) Shape of molecule

σ_1 calculated from viscosity } at corresponding temp for ...

V = molec volume $\frac{m}{\rho}$

if $\frac{V}{\sigma_1^3}$ = the same for all liquids, then the mol = spherical

otherwise oblate spheroid ~~ellipsoid~~ where σ_1 

$$\frac{V}{\sigma_1^3} = \frac{\sigma_2}{\sigma_1} \text{ } \} \text{ relative values calling } \frac{V}{\sigma_1^2} = \sigma_2$$

varies number between 3.97 $CHCl_3$

and 8.47 $C_4H_{10}O$

absolute value of $\frac{\sigma_2}{\sigma_1}$? Sutton: diam of atom $\sim m^{1/6}$

cross section of mol. $\sim \Sigma m^{1/3}$

Vol of mol. (Traube) $\sim \Sigma\sqrt{m}$ radius $\sqrt{\Sigma m^{1/3}}$

$\therefore \sigma_2 \sim \frac{\Sigma\sqrt{m}}{\Sigma m^{1/3}}$ $\therefore \sigma_1 = \frac{(\Sigma m^{1/3})^{3/2}}{\Sigma\sqrt{m}}$ numbers 2.2 − 3.9 oblate spheroid

calculating these values $\frac{(\Sigma m^{1/3})^{3/2}}{\Sigma \sqrt{m}}$ for various compounds p. 449

Hg	1
H_2	1·415
CO	:
NO	:
O_2	.

Isobutyl valerianate $C_9H_{18}O_2$ 5·046

On the whole very scarce experimental evidence!

Tyrer Ph Mag. 20 p. 522 (1910)

Empirical relations: latent heat of liquid L } at boiling point
mol. vol. " V
mol. weight M

$$LM = K\sqrt[3]{V}$$

$K = 1583$

very exact agreement except for associated liquids (H_2O, alc., acids)

Troutons equation $LM = 20·5\ T$

$$\therefore\ T = k\sqrt[3]{V}$$

not so exact

Mills Ph Mag 20, 629, 1910 ~~the~~ Molecular Attraction

Newton's law! maintains that: $\frac{L - E_e}{\sqrt[3]{d} - \sqrt[3]{D}} = \text{const}$

$\frac{d}{D}$ density: liq. / vap.

L = heat of vaporiz.

E_e = work external pressure

no confidence

Jeans Analysis of Radiation from Electron Orbits Ph M. 20, 642, 1910.

Previously the author has shown radiation can be explained by electrons describing orbits about centres of force only if $F \sim \frac{1}{r^3}$: Ph. M. 17, 773; 18, 209 (1909)

Extension of these researches in other way

See also Thomson Ph M 14, 223 1907

result for open orbits:

displacement law requires force $\frac{1}{r^3}$

$\frac{1}{r^n}$ law ([illegible]) exists for greater distances radiation therefrom must exist but it is far in the infrared

but also for $\frac{1}{r^3}$ contradiction with Maxwell's law

very interesting

Ph 20 p 657 1910 Sutherland Mechanical Vibrations of Atoms

finds mechanical vibr. of atoms (calculated out of rigidity etc)

to be of order of magnitude of Eigenschwingungen for NaCl KCl etc

---

Ph M 20. p. 1910 Rutherford & Geiger

Number of α particles from U : $2.37 \cdot 10^4$ per g and sec.

U mineral : $9.6 \cdot 10^4$

Th : $2.7 \cdot 10^4$

∴ Production of He per gram per year: U : $2.75 \cdot 10^{-5}$ cm³

Th : $3.1 \cdot 10^{-5}$

U mineral (equilibr.) $11.0 \cdot 10^{-5}$

Ra equil. 158 cm³

Range of α particles from U = 2.7 cm (contrary to Bragg : 3.5)

Actinium 2.8 cm

20, 835 1910 H A Wilson

Ph M. 20, 121 1910 H A Wilson } Statistical Theory of Heat Radiation

" 350 " Larmor

Ph M. 20. p. 320. 1910 Beatty Prod. of Cath. Particles by Long. Rö Radiat. and their Absorption by H_2 and Air

Abs. Coeff. of air (

Energy of corpuscles in Volts	λ air	λ H_2	
4.000	645	144	Lenard
20.000	31		Seitz
30.000	3.8	0.47	Lenard

radiator	λ air	λ H_2
Fe	87.2	17.05
Zn	42.7	7.71
Sn	3.97	0.57

PM 20 p. 943 1910 Very interesting

Jeans On Non Newtonian Mechanical Systems and Planck's Theory of Radiation

Law of Entropy } a probability law, independent of mechanical laws
Equipartition }

Planck's law requires necessarily atomistic constitution of energy

very simple deduction of Planck's law:

Vibrators can have energies $0, \varepsilon, 2\varepsilon \ldots$

Probability of these:
$$\cancel{1 : e^{-\frac{2h\nu}{}} : e^{-\frac{h\nu}{}} \ldots}$$
$$1 : e^{-\frac{\varepsilon}{RT}} : e^{-\frac{2\varepsilon}{RT}} \ldots$$

N vibrators; $N = M\left[1 + e^{-\frac{\varepsilon}{RT}} + e^{-\frac{2\varepsilon}{RT}} \ldots\right]$

their total energy: $E = M\varepsilon\left[e^{-\frac{\varepsilon}{RT}} + 2e^{-\frac{2\varepsilon}{RT}} \ldots\right]$

$$E = \frac{N\varepsilon}{e^{-\varepsilon/RT} - 1}$$ taking $\varepsilon = h\nu$ we have Planck's law

Pr. C. Ph. S. 15 p. 465 (1909–1910)

J J Thomson. On the Scattering of rapidly moving Electrified Particles.

Mean Deflection when (particle) passing through atom $= \theta$

average deflection after having passed through n atoms : the same as average value of n displacements of arbitrary phase and of constant amplitude $= \theta\sqrt{n}$ (Rayleigh Sound 2 ed. I Vol. p. 35)

$\therefore$ if corpuscles moving normally through plate of thickness t, N atoms per unit volume, $b =$ radius of atom

Mean deflection $= \theta\sqrt{N\pi b^2 t}$. (if small)

Regarding atom as consisting of N_0 neg. corp. and equal quantity of + el., calculate the Deflection of rapidly moving particle by one electron ($\sim \frac{1}{r^2}$) $= \dfrac{2e^2}{mV^2}\dfrac{1}{x}$

$V =$ velocity, $x =$ perpend. from corp. on direction

$\therefore$ Mean value by corp. within distance a of line of motion $\left(\dfrac{\int_0^a \frac{2x\pi\,dx}{x}}{\int_0^a 2x\pi\,dx} = \dfrac{2}{a}\right) = \dfrac{4e^2}{mV^2 a}$

number (such) coll. $= n\pi a^2 l$ if $n =$ number of corp. per unit atom, $l =$ length of path in atom

$\therefore$ average total deflection $= \dfrac{4e^2}{mV^2 a}\sqrt{n\pi a^2 l} = \dfrac{4e^2}{mv^2}\sqrt{n\pi l}$

mean value of $l = \frac{4}{5}\sqrt{2b}$

$\therefore$ mean value of ϕ_1 due to corp. in atom $\theta = \dfrac{16}{5}\dfrac{e^2}{mv^2}\sqrt{n\pi b} = \dfrac{16}{5}\dfrac{e^2}{mv^2}\dfrac{1}{b}\sqrt{\dfrac{3N_0}{2}}$

If + el. N_0 uniformly distrib. through sphere b, it is easy to prove : $\phi_1 = \dfrac{e^2}{mv^2}\dfrac{N_0}{b}\dfrac{\pi}{4}$

If + el. consisting of units $\phi_2 = \dfrac{16}{5}\dfrac{e^2}{mv^2}\dfrac{1}{b}\sqrt{\dfrac{3N_0}{2}}\sqrt{1-\left(1-\frac{\pi}{8}\right)\sigma^{1/3}}$

$\sigma =$ ratio of the vol. occupied by + el. : total volume of the atom

Mean defl. due to + and − charges = $\sqrt{\theta_1^2+\varphi_1^2}$ resp. $\sqrt{\theta_1'^2+\varphi_1^2}$

∴ Average deflection when passing through thin plate:

$$\frac{e^2}{mv^2}\left[\frac{384}{25}N_0+\frac{\pi^2}{16}N_0^2\right]^{\frac{1}{2}}\sqrt{N\pi t}$$ if + el. distrib. unif.

resp. $$\frac{e^2}{mv^2}\left[\frac{384}{25}N_0\left\{2-\left(1-\frac{\pi}{8}\right)b^{1/3}\right\}\right]^{1/2}\sqrt{N\pi t}$$ ~~according to~~ if + el. concentrated in spots with

Suppositions underlying this formula are: 1). defl. small

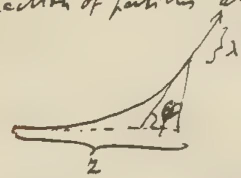
2) no change of velocity (Disch. of El. thr. Gases 2 ed. p. 378)

then thickness required to produce given deflection varies as:

$$\frac{m^2v^4}{e^4\,N N_0\left[\frac{384}{25}+\frac{\pi^2}{16}N_0\right]}\quad \text{resp.} \ldots$$

This remains true, even if defl. not small, provided vel. unchanged:

fraction of particles at distance z having deflection: $m\theta<\varphi<(m+1)\theta$ $=\varphi(z,\theta)$



If in plane:

$$f(z+\lambda\cos\varphi,\ m\theta)=\tfrac{1}{2}f[z,(m-1)\theta]+\tfrac{1}{2}f[z,(m+1)\theta]$$ expanding by T. T.:

$$\frac{\partial f}{\partial z}\lambda\cos\varphi=\frac{1}{2}\frac{\partial^2 f}{\partial\varphi^2}\theta^2$$

∴ if we put $\frac{\theta^2 z}{\lambda}=z'$

$$\frac{\partial f}{\partial z'}=\frac{1}{2}\frac{\partial^2 f}{\partial\varphi^2}\frac{1}{\cos\varphi}$$

it follows that layers of diff. subst. will produce the same defl. if their thickness

$\sim \frac{\lambda}{\theta^2}=\frac{1}{\theta^2(N\pi b^2)}$ which is identical with the result above

In reality defl. are not all in one plane we have in reality

1). $\cos\varphi_1 = \cos\varphi_2 \cos\theta + \sin\varphi_2 \sin\theta \cos\psi$ all directions of ψ equally probable

$$f(z+\lambda\cos\varphi, \varphi_1) = \int_0^{2\pi} \frac{d\psi}{\pi} f(z,\varphi_2)$$

2). $$= f(z,\varphi_1) + \frac{\partial}{\partial\varphi_1} f(z,\varphi_1) \int_0^{2\pi} \frac{d\psi}{2\pi}(\varphi_2-\varphi_1) + \frac{1}{2}\frac{\partial^2}{\partial\varphi_1^2} f(z,\varphi_1)\int_0^{2\pi}\frac{d\psi}{2\pi}(\varphi_2-\varphi_1)^2$$

from (1): $\varphi_2 - \varphi_1 = \theta\cos\psi - \frac{1}{2}\theta^2 \cot\varphi_1 \sin^2\psi$

$$\therefore (2):\quad \lambda\cos\varphi \frac{\partial f}{\partial z} = -\frac{1}{4}\theta^2 \cot\varphi \frac{\partial f}{\partial \varphi_1} + \frac{\theta^2}{4}\frac{\partial^2 f}{\partial\varphi^2}$$

$$\frac{4\lambda}{\theta^2}\frac{\partial f}{\partial z} = -\frac{1}{\sin\varphi}\frac{\partial f}{\partial\varphi} + \frac{1}{\cos\varphi}\frac{\partial^2 f}{\partial\varphi^2}$$

$\cos\varphi = t$

$\frac{\theta^2 z}{\lambda} = z'$

$$\downarrow$$

$$4\frac{\partial f}{\partial z'} = \frac{1-t^2}{t}\frac{\partial^2 f}{\partial t^2}$$

therefore the same result as before

Path of particle moving so that defl. = equal average defl.

$\varphi = \sqrt{n}\cdot\theta$ $\quad n = \frac{s}{\lambda} \therefore \varphi^2 = \frac{s\theta^2}{\lambda}$

$dx = ds\cos\varphi = \frac{2\lambda}{\theta^2}\varphi\, d\varphi \cos\varphi$

$$x = \frac{2\lambda}{\theta^2}\left[\varphi\sin\varphi + \cos\varphi - 1\right]$$

for $\varphi = \frac{\pi}{2}$ $\quad x = \frac{\lambda}{\theta^2}(\pi - 2)$ $\quad$ if x greater particle will begin to travel back going so this must be comparable with the distance at which number of particles crossing plane ⊥ to original direction = reduced to $\frac{1}{2}$

by substituting $\frac{\lambda}{\theta^2}$ previously found:

$$x = (\pi-2)\frac{m^2 v^4}{e^4 N\pi}\left[\frac{25}{384\, N_0\left[2-(1-\frac{\pi}{8})6^{1/3}\right]}\right]$$

putting $\frac{e}{m} = 5\cdot 1.10^{17}$; $e = 5.10^{-10}$; $v = 10^{10}$

$N = 2.3.10^{19}$

Or there found cathode rays of such velocity travel 0.5 cm of oxygen before number moving forward reduced to $\frac{1}{2}$ putting $x = 1/2$ we get $N_0 = 50$ that is the same order of magnitude as atomic weight.

Heiden p 117 – 136

N. Campbell The study of discontinuous phenomena

p 117 „The trend of modern theory is everywhere to replace by discontinuity the continuity which was the basis of the science of the last century"

Compendium:

Series of s trials in each of which one of the two mutually exclusive events A, B must happen

probability of A = p
B = q

Then it can be shown easily that probability of A happening $(ps-x)$ times is

$$\frac{s!}{(ps-x)!\,(qs+x)!}\, p^{ps-x}\, q^{qs+x}$$

mean value of „deviation" x for a large number n of (sets of s) trials

$$\overline{x^2} = \sum x^2 \frac{s!}{\cdots} \cdots = s\,p\,q$$

$$\bar{x} = 0$$

$$|\bar{x}| = \sqrt{\frac{s\,p\,q}{2\pi}}$$

How „large" number of sets of s trials? Measure of precision $\sqrt{n}$ for given error in these mean

if error < 1% we must have $n > 10^4$ sets of trials,

Applications to Regener, Geiger's observations of Schweidler fluctuations

perceptible to few observ.

experimental fortuitous

Ibidem p 273

<u>Crowther</u> Scattering of β-rays from Ra by Air

$$I = I_0 e^{-\sigma d} \qquad \sigma = \text{coeff of scattering}$$

v	$\sigma_{(cm^{-1})}$	$v \sqrt[4]{\sigma}$	$(1-\beta^2)^{-\frac{1}{4}} v \sqrt[4]{\sigma}$
$2.26 \cdot 10^{10}$	.255	$1.61 \cdot 10^{10}$	$1.98 \cdot 10^{10}$
2.50	.134	1.51	2.03
2.74	.072	1.42	2.23
2.84	.040	1.27	2.23

Lorentz formula $m = m_0 (1-\beta^2)^{-\frac{1}{2}}$

$.m^2 v^4$

Ibidem p. 310

<u>Campbell</u> Discontinuities in Light Emission

Schweidler: if any effect of which the magnitude can be measured is due to random occurrence of a finite number of independent events

Congr. Liège (1905)

then the magnitude will show fluctuations about a mean value and from these the number of events can be calculated

Square of the mean fluct of the sum or diff. of two such effects = $\sum$ [mean fluct. of the two e$]^2$

if and only if the events which constitute one effect are wholly independent from those of the other

If, on the other hand, there is complete correlation, the mean fluct of difference = 0

The beams of light split into two parts (half silvered mirror); photo electric current; fluctuation balance

difficulty: influence of intensity of light which never was enough constant. Therefore failure of measurement.

According to Planck ~~quantum of energy~~: $e = 6.5 \cdot 10^{-27} \nu$ (ν = frequency of light)
quantity of light contained in one light disturbance

"Quantum theory" of light

~~energy quanta~~: thus each such light disturbance would shut off 3 electrons in case

Ibidem p. 375

J J Thomson: On the theory of the motion of charged ions through a gas.

usual method of calculating velocity of charged ion through gas: $v = \frac{Xe}{m}\frac{\lambda}{u}$

neglects „persistency" of impressed motion

Autheren Maxwell's calculation $\frac{1}{r^5}$ can be used if we consider ~~the~~ molecules as acting like conducting spheres. $F = \frac{e^2a^3(2r^2-a^2)}{r^3(r^2-a^2)^2}$ $\lim F = \frac{2e^2a^3}{r^5}$

only change in numerical values of $A_1 A_2$

diffusion: $D_{12} = \frac{1}{2k}\sqrt{\frac{m_1+m_2}{m_1m_2K}}\frac{1}{A_1(\nu_1+\nu_2)}$ $\nu_1 \nu_2$ number mol in cm^3, K force at unit distance

$K = 2e^2a^3$ $k = \frac{N}{2p}$

$N\frac{\pi a^3}{4} = \mu_2 - 1$ μ_2 = refract index N mol per cm^3

ν_1 to be neglected in comparison with ν_2

$$D_{12} = \frac{1}{2k}\sqrt{\frac{m_1+m_2}{m_1}}\sqrt{\frac{8\pi N}{e^2(\mu_2-1)}}\frac{1}{A_1\nu_2}$$

considerations for mixed gases and Wellisch experiments [illegible]

if m_1 great in comp with mass of gas molec. then nearly independent of it

mobility of ion = $k = D_{12}\frac{Ne}{\pi}$ → pressure due to N mol. per cm^3 (?)

$$= \sqrt{\frac{m_1+m_2}{m_1m_2}}\sqrt{\frac{8\pi N}{\mu_2-1}}\frac{1}{A_1\nu_2}$$

Thus for $m_1 > m_2$ mobility ought to be indep. of electric charge, of mass of ion will vary at const. pressure $\propto \frac{\theta}{\sqrt{m_2(\mu_2-1)}}$ this not true for positive ions in flames

in accordance with Phillips but rapid increase, can be explained if +charge not bound but if it can pass from one molec. to the other, like electron

Ibidem p. 210

Dixon On a property of summable functions

Theorem of Vallée-Poussin: if $f(x)$ = limited integrable function in interval $-\pi < x < \pi$

and if $a_0 = \frac{1}{\pi}\int_{-\pi}^{+\pi} f(t)\,dt$ $\qquad a_n = \frac{1}{\pi}\int f(t)\cos nt\,dt$

$$b_n = \frac{1}{\pi}\int \quad \sin$$

then $\frac{1}{2}a_0^2 + \sum(a_n^2 + b_n^2)$ is a convergent series whose sum is

$$= \frac{1}{\pi}\int_{-\pi}^{\pi}[f(t)]^2\,dt.$$

Also if a_0' a_n' b_n' analogous Fourier constants of a second function $\varphi(x)$

then $\frac{1}{2}a_0 a_0' + \sum(a_n a_n' + b_n b_n') = \frac{1}{\pi}\int_{-\pi}^{+\pi} f(t)\,\varphi(t)\,dt$

Hobson Functions of a Real Variable p. 715-7, 723-5 . . .

Literatur ~~Atom~~ Entwicklung Atomistik

Stallo, Rosenberger, Pfeiffer Poggendorff: Gesch. Chemie; Hartmann Weltanschauung d. mod. Ph.

~~[illegible]~~ Arrhenius Theorien d. Chemie, Stark p. 362, 429

Graetz I p. 163, 194

Crowther Anzahl d. ~~[illegible]~~ Elektronen im Atom Ph. Z. 11, 1145 (1910)

Aus Absorption d. β Strahlen u. Thomson's Formel: Zahl d. Elektr. = 3× Atomgewicht

Einstein & Hopf. [illegible]

Ann 33 p 1096

[illegible]

[illegible] Absorption law e^{-kx}

Deduction of it by aid of II law of thermod. and Clausius Virial Th.

Bateman Some ~~[illegible]~~ Problems in the Theory of Probability   Phil. Mag. 21, 745, 1911

The Number of Electrons in the Atom
(H A Wilson   Phil Mag 21, 718 (1911)

Millikan Question of Valency in Gaseous Ionization   Phil Mag. 21, 753, 1911

ions = molec. ± one electron

Atomistyka

(1) materyi — (2) elektryczności (może w gruncie rzeczy to samo) | (3) energii ?

− +

(I) atomy skupienia gazy ?

stosunki multiple Proporcyonalne (Dalton) — prawa Faradaya (elektr. Valenz)

układ — krystallografia — optyczne i elektr. wł. kryształów (skut. dipol ?)

} nawet gdyby tak małe i tak dużo że nie można indywidualnie skonstatować.

(II) … od liczby i wymiarów:

zboczenia od równomierności; entropia etc..

odwracalne — Termodynamika tylko przybliżona

(Zatemann[?])
1). Brown.
2). opalesc. ; Svedberg
3). temp ?

Schweidler, Rutherford

nieodwracalne

prawo lepkości
przew. ciepła
dyf.
kinetyka chemiczna
ultramikrosk.
sprzężenie zjawiska przy powierzchni
ślizganie, skok temp. etc

przewodn. gazów
elektrol.
metali
promieniotwórczość

promieniowanie →

(III) indywidualne atomy dowody

ultramikrosk. Svedberg
Perrin Einst. Dybaczewski[?]

Millikan !

czy ? najpewniejsze

struktura atomu ?

$$O_2 \quad c_v = \ldots$$

$$H_2 \quad c_v = \ldots 82$$

50 cm

Mol. wärme d. H_2

θ:	273·1°	198	184	91	82	
	4·84	4·41	4·39	3·…	3·30	
	4·81			3·…	3·30	
				3·27		
				3·33		
				3·32		

50 45 40

$$\frac{\partial C_v}{\partial v} = T \frac{\partial^2 p}{\partial T^2}$$

auf … :

273·1	195·5	110	100	91	8…	…	…
4·83	4·39	3·52	3·52	3·25	…	3·30	2·98

Ergänz. … – Zeh…

Rayleigh Colours of Sea and Sky

Nature 20 p 48 (1910) Friday discourse Roy. Inst. 25/2 1910

it should however not be overlooked that a molecule, especially a diatomic molecule, can hardly be supposed to behave as if it were the dielectric sphere of theory. Questions are here suggested, for the decision of which the time is perhaps not yet ripe.

According to the now generally accepted i.e. electron theory complete polarisation at 90° requires that the dispersing particles should behave as if spherical, even although infinitely small. If the shape be elongated, there would be incomplete polarization combined with similarity of colour even under the simplest conditions.

The Life of W. Th. B.K. of L. S. P. Thompson I XX + 584
II XI + 585 - 1297
Macmillan Co 1910 30s/net

Smoley Inouye Kataoka. [illegible] Z. [illegible] 9 p 49 (1911)
[illegible] E. F. [illegible]
[illegible] Aggregat[illegible]

[illegible]

[illegible]

[illegible] 08. [illegible]

I [illegible]

pro [illegible] E in Volts : independ[illegible] [illegible]

	1 n	1/2	1/5	1/10	1/40	
[illegible]	$6{,}5 \cdot 10^{-5}$	[illegible]	[illegible]	[illegible]	[illegible]	$\cdot 10^{-5}$
[illegible]	8	[illegible]	[illegible]	[illegible]	225	
[illegible]	[illegible]	-4	[illegible]	-80		

II [illegible] [illegible] +

[illegible] [illegible] [illegible] <u>inverse</u> [illegible]

[illegible]

[illegible]

III. [illegible]

[illegible] E [illegible] décroissant

[illegible] croissant

p. ex. $\frac{1}{10}$ n [illegible] dans des intervalles à [illegible].

33 | [illegible] | [illegible] 25 | [illegible] 18,5 | [illegible] $\cdot 10^{-5}$

$\frac{1}{5}$ n [illegible] [illegible]

-6 [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] été lavé avec solution plus concentrée ; [illegible] [illegible] constant même quand [illegible] de nouveau.

p. [illegible] Valeurs [illegible] .

C.R. 153 p. [illegible] [illegible]

p. [illegible]

$$\varsigma = 4\pi\mu\sigma \frac{E}{P}$$ [illegible]

[illegible]

for 1n $CuSO_4$ $\mu = 0.0[illegible]$

$\sigma = 346 . 10^8$ (électrost.)

[illegible]

[illegible]	$\frac{1}{250}$	[illegible]	[illegible]	[illegible]	[illegible]	$\frac{1}{25}$	$\frac{1}{10}$	$\frac{1}{2}$	1
[illegible]	0.51	[illegible]	0.169	0.12	0.150	0.156	0.159	0.38	0.56

Zn [illegible]

$\frac{1}{40}$	$\frac{1}{20}$	[illegible]	$\frac{1}{5}$	1
0.71	0.66	0.3[illegible]	[illegible]	[illegible]

Cu [illegible]

	$\frac{1}{10}$	$\frac{1}{2}$	1
[illegible]	−0.82	−0.28	−0.36

Villat CR 154 p. 1693 [illegible] [illegible]

P. Zeeman & C.M. Hoogenboom [illegible] Doppelbrechung in [illegible] [illegible] 20 p. 5[illegible], [illegible] 1911/12
[illegible] 36 [illegible]

NH_3 + [illegible] Nebel prop. [illegible]$)^2$ [illegible] (Elemente [illegible])

[illegible]

Cotton [illegible] C.R. 154 p. 930 1912
p. [illegible]

Oseen R. St. Fennl. [illegible] [illegible] [illegible]

Ekman On the Change from Steady to Turbulent Motion in Liquids } Arkiv f. Mat. astr. och Fysik Stockholm Band 6 1911

Experiments (against Reynolds, no critical vel. but dependent on shape of mouthpiece and external disturbances)

Bibl. Techn. Wien 1280 $\boxed{36.441\ \mathrm{I}}$

Z. f. [illegible] 78 [illegible] 360 [illegible] 152 [illegible]

[illegible]

[illegible] Verber, [illegible] [illegible] 2 mm

cca 50 $\mu\mu$ [illegible]

aussi mouvements tourbillonaires de très petit rayon

P. Pirie [illegible] Verhandlungen [illegible] 101 [illegible] 1911

[illegible] Zittersheim [illegible] Fellnert [illegible]

$N = 6{\cdot}1 . 10^{23}$ [[illegible] $e = 9.75\ 10^{-11}$ [illegible]]

Diffusion [illegible] 1% $FeCl_3$ [illegible]

[illegible] $28 . 10^{-8}$ cm

Weite der Kanäle [illegible] 10% Seifenlösung $6.7\ 10^{-8}$ cm

H. Zangger Z. f. Ch. u. Ind. d. Koll. 9 p 216 (1911)

[illegible] $N = 6{\cdot}24,\ 6{\cdot}19,\ 6{\cdot}32 . 10^{-23}$ [illegible]

[illegible]

[illegible] 1912 [illegible]

Rubens et Hertz [illegible]
[illegible] 1912 p 385
[illegible]

I Roux C R 152 p 1168 La charge de l'électron
[illegible]
[illegible]
[illegible]
[illegible]

Curie CR 152 p. 1165 [illegible] e
[illegible] e [illegible]

---

p 1380 Les grandeurs molécul (nouvelles mesures)
[illegible] bien une forme

$\delta = 1'1942$

1). rayon : numération des volumes comme d'[illegible]
10 000 grains $r = 0'3667\ \mu$

2) Stokes 0 368 (moyen)

r. 0'367

concentration photog. [illegible] 17000 grains [illegible]

$N = 68'3 . 10^{22}$ $e = 4'15 . 10^{-10}$

II [illegible] pendant $\frac{1}{2} - \frac{1}{2}$ minute

1500 segments $N : 68'8 . 10^{22}$ donc ~~[illegible]~~ $e = 4'2 . 10^{-10}$

Annalen p. 1382

(1+2.5 v)

N = 7.10^23

p. 359

vers. 115

N = 76, 73, 66, 74 moyen 72. 10^22

(Strutt ... 34, ... 1910

Stein ... II 5 ... 1912

(Cotton ... CR 154, 30)

Phys. Rev. 23 (1887) p 489 ... a few inches long, a needle ... some ...

90 feet in the ... $\frac{1}{1000}$ ...

Quartz threads ...

$= 3.10^{5}$ cm $= 0.3\mu$

... less than $\frac{1}{10^{5}}$ inch for some distance from the ...

(Ostwald ... Freiberg 36, 848

Theorie ... Amer. Ph.

(Am) a)

Radius 24·7 $\mu\mu$

1). λ_x		ber
	4·4	4·7
	7·0	[illegible]
	8·9	8·5

17°20

2). $R = 30·5\ \mu\mu$

$\theta = 17°10$

[illegible]	[illegible]
6·9	[illegible]

Th Kern hydrosol (R Zsigmondy)

15°91 $R = 26·8\ \mu\mu$

λ_x	ber
[illegible]	4·6
[illegible]	6·5
[illegible]	8·0
[illegible]	9·2
[illegible]	10·3
7·2	11·3

[illegible] (1,2)

[illegible] Aggregate [illegible]

Th[illegible] [illegible]

normal [illegible]

[illegible]

+ Zangger 7 216 1911

Emulsion ... in ... ca 750 ...

... 52 − 87. 11^{2}

$N =$ 624

...

...

... Holtsmark ... p 158

... Holtsmark p 159

Öl emulsion ...

η : 0'7 ... 0 1mm ...

[0.05 Vol 1] − ... $\cdot 10^{-7}$ ... [...]

... 2000 ...

$2'3 \cdot 10^{8}$ ...

$\rho = 2$ ... Abstand $3'25 \cdot 10^{-4}$ cm

... Nägeli ... p 16 . (...)

... 7 p. 1 ...

De Broglie $^{1/2}$ 148 . 1163, 1315 ...

3 − 4 ...

...

... $r = 22 \mu\mu$

Zeit ...	λx	ber. ...
1	4 ...	41
2	57	58
3	66	76
4	83	...

...

(Smoluchowski ... 16, 779 (1908) !

[illegible] 6, 235 [illegible]

[illegible] 2 [illegible]

[illegible] CR 146 1908 [illegible] 747 [illegible] (1908) [illegible]

[illegible]

[illegible]

[illegible] 17 [illegible] 129

[illegible] Phz 10 970

[illegible] (7) 1, 132

[illegible] ; [illegible]

Merlin CR 136 137, [illegible] 1903 [illegible] 1903

Chaudier CR 142 (1906) p. 201

141 p. 349 Cotton, Mouton

[illegible]

7. 77 [illegible]

[illegible] ⊥ lignes de force [illegible]

[illegible]

[illegible]

1). vieux [illegible]

2). échantillons du fond plus [illegible]

3). [illegible] ; mais [illegible] elle mérite

[illegible]

Schmauss a [illegible]

4). Tous les deux [illegible] ⊥ [illegible]

[illegible] chauffage augmente [illegible] de [illegible] . [illegible]

et [illegible]

II [illegible] autre loi 

[illegible] près [illegible]

[illegible] ([illegible] du plan de [illegible])

Ce qui est dû à une [illegible] || [illegible]

Les particules [illegible]

on les voit [illegible]

III [illegible]

pour 2 [illegible] $NaCO_3$ $CaNO_3$ — cristaux [illegible]

[illegible]

d'une rotation [illegible]

Ce dernier [illegible] a obtenu la rot. [illegible]

[illegible] poudres

Il n'avait pas [illegible] probablement parce que ses particules

étaient trop grosses

[illegible] si grosses entre [illegible]

9. [illegible] CR 1[illegible] [illegible]

[illegible] Terpentin [illegible] CS_2 [illegible]

[illegible]

[illegible]

1 p 30 [illegible]

2 [illegible]

[illegible]

CS_2 / [illegible] Terpentin [illegible]

[illegible]

CS_2 [illegible] Terpentin [illegible]

[illegible]

[illegible] p 1039 [illegible]

p 1305, 1438, CR 137, 42

[illegible] (250) [illegible]

[illegible]

[illegible]

J. Chandier CR 132 p [illegible]

[illegible] 7.45 [illegible]

[illegible]

S. Sutton (? 136 p [illegible] [illegible]

[illegible]

[illegible]

Sutton (? p. 382 1920)

[illegible] $V_{100} = -0.79 \cdot 10^{5}$

		"
Fe [illegible]	267	20.180
[illegible]	18.2	2.10
[illegible]	0.363	2.1
Oh	-13.0	[illegible]

[illegible] Ann. 25, p. 848 [illegible]

[illegible]

$$i(T-T_n) = k$$

[illegible] Fe [illegible]

[illegible] (20 [illegible])

[illegible]

Planck Thermodynamik p. 84

[illegible]

[illegible]

[illegible]

---

p. 78 [illegible]

[illegible] Energie [illegible]

[illegible]

[illegible] [illegible]

Kolthmann [illegible]

[illegible]

J. Tamm p. 479 [illegible] Druck

Tammann [illegible] Flüssigk. bei Drucken > 500 [illegible] $(V - V_{\infty} \ldots)$ [illegible]

[illegible] const.!

[illegible]

$\eta = K(A - \vartheta)$ bei hohem Druck [illegible]

$\eta = K'(A' - \vartheta)$ [illegible] η = [illegible] für Äther u. CS_2 [illegible]

[illegible]

V. i. A. [illegible]
[illegible]
1

η = 0·00355	10°	20°	35°	
	p = 1000	1500	1350	ly
	vel = [illegible]	0·[illegible]	0·[illegible]	
0·0175	p = 1700	2000	2050	
	vel = [illegible]	0·[illegible]	0·[illegible]	
0·0[illegible]	p = [illegible]	2[illegible]	3[illegible]	
	vel = 0·858	0·[illegible]	0·[illegible]	

Cu

η = 0·00[illegible]	60	200	[illegible]
	p = 1	350	[illegible]
	vel 1·000	0·[illegible]	0·[illegible]
0·00600	p = 510	1[illegible]	[illegible]
	0·962	0·[illegible]	0·[illegible]
0·0[illegible]	p = 1[illegible]	1[illegible]	2[illegible]
	vel = 0·[illegible]18	0·[illegible]18	0·[illegible]

[illegible]

η = 0·0180	10	[illegible]	[illegible]	550
	[illegible] 1	470	1300	310[illegible]
	vel = 1	0·998	0·[illegible]	0·[illegible]
[illegible]	p = 500	1120	2120	4020 +
	vel = 0·[illegible]	0·[illegible]	0·986	0·[illegible]
0·0250	930	[illegible]	290	4[illegible] +
	0·9[illegible]	0·[illegible]	[illegible]	[illegible]

[illegible] : [illegible] [illegible]

[illegible]

[illegible]

[illegible] 86 ; [illegible]

25 [illegible] [illegible] 4[illegible])

[illegible] : [illegible] CO_2 [illegible] 70 [illegible] , [illegible]

3·20°

[illegible] : [illegible] : 2 [illegible]

[illegible] [illegible]

[illegible]

[illegible] 284·30° 1h

285·76 1h 20 [illegible]

2h [illegible]

2h 30 [illegible]

[illegible]

[illegible] 21%

[illegible]

3h 25 283·72 [illegible]

[illegible]

Weber s Rechau Blaue Himmel Marburg Ber. Nr 4 (1911) S. 76–86

Beibl. 37 (1913) p 503

v H_2O 10^d O ... c N v UVL ... H_2O_2

... H_2O_2 s NH_4NO_2

Hatschek Koll. Z 7, 11,

zwei möglichst engste Raumerfüllungen  wenn nächste Lage auf den 3 Punkten
oder dagegen wenn auf den andern drei

so entsteht entweder Rhombendodekaeder

oder Komb. von hexagon. Prisma mit dreiseitiger Pyramide, begrenzt von 6 Rhomben und 6 Trapezen

J. Kossonogoff Untersuchg. d. Elektrolyse mit d. Ultramikroskop Koll. Z. 7, 129, 103

Wo. Ostwald " 132

erklärt jene Beob. dadurch d. Metalle schon unter normalen Verhältnissen etwas Kolloidteilchen bilden (M. Traube-Mengarini & A. Scala Koll. Z. 6, 65, 240 (1910)), besonders Pb

dabei Hofbildung an Elektroden. ± Kataphorese.

Theorie d. elektrischen Zerstäubung

Anknüpfung an Beeinflussung durch Magnetfeld.

C. Doelter Ü. d. Umwandlg amorpher Körper in kristallisierte Koll Z. 7, 29, 86. 1910

Sehr interessante Beob. ü. Umwandlg von amorphen Niederschlägen

$BaSO_4$, As_2S_3, Sb_2S_3, $Fe_2O_3\,H_2O$, $Al_2O_3.H_2O$ etc | Anschluss an Weimarns Untersuchungen

insbesondere bei andauerndem Schütteln oder Erhitzen auf 60–70°

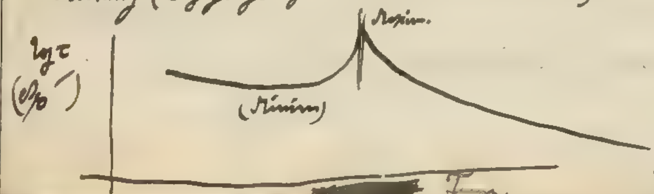
Svedberg D. Methoden zur Messung d. Br. B. Koll. Z. 7, 1, 1910

Interessante Zusammenstellung   Siehe auch Siedentopf Ph. Z. 10, 779, 1909

Rothmund. Studien ü. d. krit. Trübung Z. ph. Ch. 63, 54, 1908

Krit. Trübung bei Mischungen d. H_2O & Phenol, durch Zusatz dritter Stoffe wird vermehrt oder vermindert, wodurch auffällige Änderg d. Brechungs-Exponenten, während starke Temp. Koeff. d. inneren Reibung in der krit. Gegend unverändert bleibt.

dabei wurde Visk. auch unterhalb d. Trübungspunktes gemessen u. zwar nach gründlicher Durchmischung (wegen geringer Werte nach Stokes)



W. 37.4 % Phenol. 1 mol KCl

33°	2.064	35.7	2.362
34°	2.035	35.8	2.310
35	2.035	36.0	2.244
35.4	2.424	37.0	2.090
35.6	2.430	38.0	2.014
$\boxed{35.65\ \text{MT}}$		40.0	1.876
		42.0	1.769
		44.0	1.677

Z. Lauer u. G. Tammann   Ü. Verschiebungselastiz. bei Flüssigkeiten. Zphch. 63, 141, 1908.

Elastizität [illegible] von 181°C, [illegible]

Ästhetik u. H_2O [illegible] temp. [illegible] 30°C [illegible] Elast.; [illegible] 410°,

[illegible] Glycerin [illegible] Elast. [illegible] 630

Z. Pissarjewsky u. E. Karp   D. Ber. f. Diff. [illegible]

Zphch. ibidem 257

A. Christoff   Nicht elektrolyt. Auflösung [illegible] in H_2O ibidem 346
(bei erhöhter Temperatur)

H. C. Jones etc.. Conductivity & Viscosity in mixed ~~solutions~~ solvents
H_2O, CH_3OH, C_2H_5OH, CH_3CO etc..   ibidem p. 509
Carnegie Institute Wash. 1907

Sackur Thermoch. u. Thermodyn. 255   Noyes Kato u. Sosman: Zphch. 73, 1 (1910)

Dissoziationskonstante von H_2O:

t	$K \cdot 10^{14}$	$-Q$ bei = Diss. Wärme
0	0·088	14500
18	0·46	13800
25	0·81	13000
50	4·5	11800
75	16·9	10400
100	48	9220
128	114	
156	217	7850

$$\frac{d \log K}{dT} = -\frac{Q}{RT^2}$$

Da Q abnimmt folgt, dass die freien Ionen zusammen eine geringere spez. Wärme besitzen als ungespaltenes H_2O

Jun Ishiwara   Eine Revision d. Ausdruckes für die elektromagn. Masse d. Elektrons
Ph. Zs. 40, 308

Masse elektromagn. $m_0 = \frac{4}{3}\frac{U_0}{c^2}$ ist wohl ein elektrostatischer Ruhenergie zu berücksichtigen U_0
Impuls-Masse

M. Born & Th. v. Karman Ü. Schwingungen von Raumgittern Ph. Z. 13, 297, 1912

§1. Eindimensional: $m\ddot{u} = \alpha(u_{n+1} - 2u_n + u_{n-1})$

$$u_n = u\, e^{i(\nu t + n\varphi)}$$

$$\left(\begin{array}{l} na = \lambda \\ \lambda = \frac{2\pi a}{\varphi} \end{array} \right.$$

$$\nu = \nu_0 \sin\frac{\varphi}{2}\,; \qquad \nu_0 = 2\sqrt{\frac{\alpha}{m}}\,;$$

$$w = \text{Wellengeschw.} = \frac{\nu\lambda}{2\pi} = \frac{\nu_0}{2\pi}\lambda \sin\frac{\pi a}{\lambda} = \frac{a\nu}{2\arcsin\frac{\nu}{\nu_0}}$$

Grenzfrequenz $\varphi = \pi$, $\lambda = 2a$

§7. $T = \frac{m}{2}(\dot{u}_{-2}^2 + \dot{u}_{-1}^2 + \dots)$; $V = \frac{\alpha}{2}\left((u_{-2}-u_{-1})^2 + (u_{-1}-u_0)^2 + \dots \right)$

Normalkoordinaten: $U_n = \dots k_{-2n}u_{-2} + k_{-1n}u_{-1} + k_{0n}u_0 + k_{1n}u_1 + \dots$

so dass: $T = \frac{m}{2}(\dots \dot{U}_{-2}^2 + \dot{U}_{-1}^2 + \dot{U}_0^2 + \dots)$

$$V = \frac{\alpha}{2}(\dots p_{-2}U_{-2}^2 + p_{-1}U_{-1}^2 + p_0 U_0^2 + p_1 U_1^2 + \dots)$$

Somit für jedes U: $m\ddot{U}_n + \alpha p_n U_n = 0$

Die Normal-Koord. findet man (Hauptachsen): $U_n = \text{Const}\sin\Big(t\overbrace{\sqrt{p_n\frac{\alpha}{m}}}^{\nu_n}\Big)$

Die Gleichungen (33) $\left\{ \begin{array}{l} -p x_n = x_{n+1} - 2x_n + x_{n-1} \\ \dots\dots \end{array} \right\}$ haben nur dann eine Lösung falls

$$\left| \begin{array}{ccccccc} \dots & \dots & \dots & \dots & & & \\ \dots 0 & -1 & (2-p) & -1 & 0 & 0 & \dots \\ \dots 0 & 0 & -1 & (2-p) & -1 & 0 & \dots \\ 0 & 0 & 0 & -1 & (2-p) & -1 & \dots \end{array} \right| = 0$$

Wurzeln dieser Gleichung seien $p_1\, p_2\, p_3 \dots\dots$

Wenn $p = p_n$ gesetzt wird so geben (33) Lösungen für x, bis auf unbestimmten Faktor welcher derart bestimmbar, dass $\sum_m x_{mn}^2 = 1$

und dann sind diese x_{mn} = gesuchten k_{mn}

wobei $\sum_m k_{mn} k_{mn'} = 0$ ist

Für ein unendlich ausgedehntes System ~~sind~~ rücken die $p_1\, p_2 \ldots$ dicht zusammen und bedecken ein Stück der p Achse kontinuierlich, denn dann haben (33) die Lösungen

$$x_n = c\, e^{i\varphi n} .$$

(38) falls $p = 4\sin^2\frac{\varphi}{2}$ gesetzt wird $\left\{\begin{matrix}\varphi=0 \\ \text{bis } \varphi = 2\pi\end{matrix}\right.$

zu jedem p Wert gehören zwei reelle Lösungen von (33) nämlich:

$$x_n = k'_{n(p)} = c\cos n\varphi_{(p)}$$

$$= k''_{n(p)} = c\sin n\varphi_{(p)}$$

Gleichzeitig wird: $U'_p = \sum_{-\infty}^{+\infty} k'_n u_n \qquad U''_p = \sum_{n=-\infty}^{+\infty} k''_n u_n$

$$T = \frac{m}{2}\int\left\{\dot U'^2_p + \dot U''^2_p\right\}\frac{1}{2} N_{(p)}\, dp$$

$$V = \frac{\alpha}{2}\int p\left\{U'^2_p + U''^2_p\right\}\frac{1}{2} N_{(p)}\, dp$$

$N_{(p)}$ = Dichte der Normalkoord. in dem Spektrum und zwar ist (wie a posteriori [illegible])

$$N_{(p)}\, dp = C\, d\varphi = \frac{N\mathfrak{L}}{2\pi}\, d\varphi$$

(da $N =$ [illegible] $\therefore \int N_{(p)}\, dp = N\mathfrak{L} = \int_0^{2\pi} C\, d\varphi$)

da nun (38):

$$dp = 2\sin\frac{\varphi}{2}\cos\frac{\varphi}{2}\, d\varphi$$

$$\therefore N_{(p)} = \frac{N\mathfrak{L}}{4\pi\sin\varphi}$$

$$\therefore N_{(p)}\, dp = \frac{N\mathfrak{L}\, d\nu}{2\pi\sqrt{\nu_0^2-\nu^2}} = \mathfrak{N}_{(\nu)}\, d\nu = \frac{N\mathfrak{L}}{2\pi}\, d\varphi \qquad c^2 = \frac{2}{N\mathfrak{L}}$$

$$\therefore \mathfrak{N}_{(\nu)} = \frac{N\mathfrak{L}}{2\pi\sqrt{\nu_0^2-\nu^2}}$$

(β β). Energie der Normalschwingg:

$$f(\nu) = \frac{\frac{R}{N}\,\beta\nu}{e^{\frac{\beta\nu}{T}}-1} \qquad \therefore \quad E = \frac{1}{Z}\int_0^{\nu_0}\frac{\frac{R}{N}\,\beta\nu\, Z(\nu)\,d\nu}{e^{\frac{\beta\nu}{T}}-1} = R\,\frac{\beta\nu_0}{2\pi}\int_0^{2\pi}\frac{\sin\frac{\varphi}{2}\,d\varphi}{e^{\frac{\beta\nu_0}{T}\sin\frac{\varphi}{2}}-1}$$

---

§2 Die dreidimensionale Raumgitter

Annahme dass nur die nächsten 18 Punkte $\left\{\begin{matrix} 6 \;\text{— — in Abstand}\; a \\ 12 \;\text{— — „}\; a\sqrt{2}\end{matrix}\right\}$ eine merkliche Kraft ausüben

Ferner: 1). Kräfte = lineare Fkt. d. Verschiebg. 2). reguläre Symmetrie 3). ...

$$\begin{aligned} X_{lmn} = {} & \alpha\left(u_{l+1\,mn} + u_{l-1\,mn} - 2u_{lmn}\right) \\ & + \beta\left(u_{l,m+1,n} + u_{l,m-1,n} + u_{l\,m\,n+1} + u_{l\,m\,n-1} - 4u_{lmn}\right) \\ & + \gamma\left(\text{- - -}\right) \\ & + \delta\left(\qquad\right) \\ & + \kappa\left(v \cdots \; w \cdots\right) \end{aligned}$$

} α relat. Versch. d. 6 Punkte

} α ~ rel. Versch. d. 12 Punkte

} α ~ y s z Versch.

Grenzübergang:

$$\frac{\bar X}{a^3} = \rho \ddot X = \frac{\alpha}{a}\frac{\partial^2 u}{\partial x^2} + \frac{\beta}{a}\left(\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right) + \frac{2\gamma}{a}\left(2\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right) + 2\frac{\delta}{a}\left(\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right) + \frac{4\kappa}{a}\left(\frac{\partial^2 v}{\partial x\partial y}+\frac{\partial^2 w}{\partial x\partial z}\right)$$

$$= c_{11}\frac{\partial^2 u}{\partial x^2} + c_{44}\left(\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right) + (c_{12}+c_{44})\left(\frac{\partial^2 v}{\partial x\partial y}+\frac{\partial^2 w}{\partial x\partial z}\right)$$

$$\therefore \quad \frac{\alpha+4\gamma}{a} = c_{11}$$

$$\frac{\beta+2\gamma+2\delta}{a} = c_{44}$$

$$\frac{4\kappa}{a} = c_{12}+c_{44}$$

Nun annähernd Annahme, dass (für die 12 Punkte $a\sqrt{2}$) die Verschiebungen ⊥ zur Verbindungslinie (eigentlich zur Normal Ausstellung!) (keine Kräfte entwickeln), also $\delta=0$, $\gamma=\kappa$

$$\therefore \quad \alpha = a(c_{11}-c_{12}-c_{44})$$

$$\beta = \frac{a}{2}(c_{44}-c_{12})$$

$$2\kappa = 2\gamma = \frac{a}{2}(c_{44}+c_{12})$$

Falls dies auch für die 6 Punkte a angenommen wird, so auch $\beta=0$ also $c_{11}=c_{44}$ (Cauchy)

X

R. Gans Ann. 37, 881, 1912 Form ultramikr. Am-Te

Vorauss.: Rot. Ellipsoide; Rayleigh's Kunstgriff: Feld im Innern quasistatisch

$\xi \parallel$ Rot. Achse

$$E_\xi = \frac{E_{\xi 0}}{1 + \frac{m'^2-1}{4\pi} P} \qquad E_\eta = \frac{}{\cdots\; P'} \qquad E_\zeta = \frac{E_{\zeta 0}}{1 + \frac{m'^2-1}{4\pi} P'}$$

$$m'^2 = \frac{m^2}{m_0^2} = \frac{\text{Dielektr. Konst. d. Ellips.}}{\text{" " " Umgebung}}$$

$$P = 4\pi \frac{1-e^2}{e^2}\left[\frac{1}{2e} \lg \frac{1+e}{1-e} - 1\right] \text{ verlängerte}$$

$$= \frac{4\pi}{e^2}\left[1 - \frac{\sqrt{1-e^2}}{e} \arcsin e\right] \text{ abgeplattete}$$

Ellipsoide

$$P' = 2\pi - \frac{P}{2}$$

Polarisation: $\mathfrak{p} = \frac{m^2 - m_0^2}{4\pi} \mathfrak{E} = m_0^2 \frac{m'^2-1}{4\pi} \mathfrak{E}$

du Vol ~

∴ elektr. Moment d. Ellips. vom Volumen V: $\mathfrak{f} = \mathfrak{p} V \begin{cases} f_\xi = & = g\, \mathfrak{E}_{0\xi} \\ f_\eta = & = g' \mathfrak{E}_{0\eta} \\ f_\zeta = & = g' \mathfrak{E}_{0\zeta} \end{cases}$

Mittelwert bei verschied. Richtg. d. Achse

$$\bar{f}_z = \left[\frac{1}{3} g + \frac{2}{3} g'\right] \mathfrak{E}_{0z} = \bar{g}\, \mathfrak{E}_{0z}$$

$$\bar{f}_x = \bar{f}_y = 0$$

Absorption pro Zeiteinheit (siehe Mie p. 436 ... 8 ... -12

$$k = \frac{4\pi N}{m_0^2} \frac{2\pi}{\lambda'} \mathfrak{Jm}(-\bar{g})$$

$$K \text{ (Abs. pro Volumenkonzentr. Eins)} = \frac{6\pi}{\lambda'} \mathfrak{Jm}\left(-\frac{a_1}{3} - \frac{2}{3} a_1'\right)$$

$$a_1 = \frac{m'^2-1}{3 + (m'^2-1)\frac{3P}{4\pi}} \qquad a_1' = \frac{m'^2-1}{3 + (m'^2-1)\frac{3}{4\pi} P'}$$

Ausrechng. d. Beobachtung zeigt:

K

λ	0.1	0.77	0.57	0.48	0.40	0.23	0.00	0.62	0.38	0.29	0.22	0.10	1.00
420	40.6	41.0	41.8	42.1	42.0	40.4	36.7	42.4	46.4	48.3	48.7	49.5	44.9
500	58.2	55.4	57.3	54.0	42.7	38.7	30.9	62.2	64.0	60.6	41.6	41.9	29.5
600	16.4	21.6	68.7	136.0	72.7	19.0	8.7	29.5	126.9	262.5	77.0	31.2	12.0
650	6.92	8.3	18.0	41.1	136.4	32.0	8.5	10.5	31.0	77.7	268.0	60.6	14.2

Nach Sterling Beob würde demnach nahe Kugelgestalt (vielleicht Oktaeder) bestehen – nicht ganz Kugel weil Polarisation nicht vollständig

Ann 47, 270, 1915 [illegible] ultramikr Ag [illegible]

R Gans Analyt Rechnung dabei auch Abhängigkeit von der Dicke d. Teilchen berücksichtigt

Exp mit Kollargol (97% Ag!) [illegible]

sehr inhomogen, infolge Zentrifugieren und noch mehr infolge Ultrafiltration [illegible] 0.168

6 [illegible] 412 μμ [illegible], ≈ Kugelgestalt, ausgenommen für die ganz kleinen Teilchen

(Beschreibung des Ultrafilters

Dipole: Reinganum { Phys Z 2, 241, 1900; Ann d Ph 10, 334, 1903; " 28, 649, 1912 }

Debye Phys ZS 13, 97, 295, 1912 (vorl. Mitt.)

Verh DPG 15, 777, 1913

Ratnowsky Verh DPh G. 15, 497, 1913

W. Sutherland Ph Mag 4, 625, 1902; 7, 417, 1904; 17, 657, 1909

Schrödinger Studien zur Kinetik d Dielektrika etc Wien Ber 121, 1937, 1912

ausführl. Referat: Beibl 37, 1210, 1913

Krüger Zur statist. Elektronentheorie der Dielektrika Ph Z 13, 246, 1912

E. Holm Ann. 44, 241, 1914

Debye: [illegible] Ph Z 15, 283, 569, 1914; Beibl. 38, 1162, 1914

Sutton CR 158, 621, 1914; Beibl ebd p. 1333

[illegible] VDPG 17, 73, 1915; Beibl. 39, 482, 1915

L.V. King Zerstr. u. Absorpt. d. Lichtes in Gasen mit Anw. auf d. Deutg. d. Intensität d. Himmelslichtes Phil Trans 212, 375-433, 1912-13

Pr RS 88, 83-89, 1913 , Beibl 37, 1324, 1913

Vervollst. d. Theorie Rayleighs durch Berücksichtg 1) Absorption

2). gleichmäßige Strahlung d. Gases

Vergleich mit Mount Whitney	4420	stimmt mit Zerstreungs theorie	(wirkliche Absorptionskoeffizient) $\alpha_0 = 4.10^{-8}$
" Wilson	1780		$N_0 = 2.32 \cdot 10^{19}$
Ostseeküste	100	Staub, absorbierend besonders unter 0.8μ	
Washington	10		

F E Fowle Avogadros Konstante u. d. atmosph. Durchlässigkeit Astrophys J. 40, 435-442, 1914

$N = (6.05 \pm 0.04) \cdot 10^{23}$ Beibl 39, 670, 1915

aus Beob. z. Mount Wilson

L. Weber. Die Albedo d. Luftplanktons Ann d Ph 51, 427, 1916

$M =$ 4π fache Wert e {Helligkeit, v. 1 $\boxed{cm^3}$ 2 Luft gegen / ähnl. bezügl 6h}

$= 0.0000408$ bis 0.0006 in Kiel für Luft im Niveau
klar (neblig)

G. Häcker Beobachtungen d. Transparenzkoeff. d. Nebels Kiel Dissert 1905

JJP Valeton Kristallform u. Löslichkeit Beibl. 40, 269, 1916

Gleiche Löslichkeit aller Kristallflächen. gegen Curie und Wulff und Ritzel

Experimente an Alaun. Bei Wachsen Flächen glänzend, bei Lösung matt.

P Othmer Studien ü. d. spontane Kristallisationsvermögen Z anorg Ch. 209, 1915 Beibl 40, 267

(Keimbildung und Wachstumsgeschwindigkeit)

W. Wilson Wirkungsquantum (Phil Mag 31, 156, 1916) Beibl. 40, 238, 1916 (!!!)

Dipol:

P. Langevin Le Radium 7, 249 (1910)

C. Bergholm Ann. 51, 414, 1916 D. Temp. koeff. d. elektr. Doppelbrechung in Flüssigkeit

bestätigt Langevins Theorie derzufolge Ordnung d. Moleküle (Dipole) die Ursache d. Doppelbr. bilden

$$\frac{B}{t} = \frac{(K-1)(K+2)(n^2-1)(n^2+2)\cdot\delta\,\delta_0}{40\,\pi R T c \lambda n}$$

c = Anzahl Gramm mol. pro cm^3

δ = 20 × elektr. Anisotropie d. Mol.

δ_0 = " " optischen " "

$$= \frac{(K+2)^2(n^2+2)^2 d}{T n}\cdot \text{Const}$$

Quadrat. Abh. d. Temp. Abhängigkeit dieses Ausdruckes stimmt genau mit Versuchsresultaten für CS_2, Nitroglykol,

C_6H_5Br, $C_6H_5NO_2$

S. Boguslawski Ph. Z. Zur Th. d. Dielektrika. Temp. abh. d. Dielektr. Konst. Pyroelektr.
(15, 283, 1914)

1). Lorentz's Elektronentheorie (H + Z unabh.) : $\frac{\varepsilon-1}{\varepsilon+2}\,\frac{1}{\rho}$ = const und $\underbrace{\text{Polar.} \sim \text{Feldstärke}}$

Ratnowsky Verh. 15, 497, 1913
fand dagegen Abnahme mit Feldstärke
für (Amyl + Amyl alkohol)

2). Debye $\frac{\varepsilon-1}{\varepsilon+2}\,\frac{1}{\rho}$ Abnahme mit steig. Temp.
Dipol-Theorie

aber seine Ansätze gleich unter er Veränderlichkeit von ρ zu berücksichtigen vergisst.

In Wirkl. stimmt dies nur für $(C_2H_5)_2O$, sonst nimmt ( ) zu mit Temp.

also nützt die Ansetzung von Dipolen nichts

Annahme Arbeit bei Verschiebung d. Elektronen : $A = ax^2 + \cancel{bx^3} + cx^4$

Dann folgt.. $\frac{\varepsilon-1}{\varepsilon+2}\,\frac{\rho}{\rho_0} = \underline{A}\,(1-\delta T)$ $\underline{A} = \frac{2\pi e^2 N_0}{3a}$ $\delta = \frac{3ck}{a^2}$, Amyl $a = 13660$
$c = -2\cdot03.10^{20}$

also Abnahme wenn $c > 0$
Wachsen $c < 0$

Abweichung von Proport. zw. Polar. Feldstärke änderbar genug (um $1/10$ % an Ratn. von $M \cdot 3,5 M$)

$V_t = V_0 (1 + at + bt^2 + ct^3) \ldots$

Dielektr. Konst. (Landolt-Börnst.)

		$D =$
Methylalk.	$-100°$	58.0
	$-50°$	45.3
	0	35.0
	20	31.2
	gefroren	3.07

Abweichg. Sinn für $\lambda = \infty$

$a = 0.00118557$
$b = 0.0(_5)156493$
$c = 0.0(_7)091113$

		$D =$
Äthylalk.	$-120°$	54.6
	$-80°$	44.3
	$-40°$	35.3
	$0°$	28.4
	$20°$	25.8
	gefr.	2.7

$a = 0.0010470$
$b = 0.0(_5)9920$
$c = 0.(0_7)1367$

Propylalk.	$-120°$	46.2
	-60	33.7
	0	24.8
	20	22.2

$0.(0_2)077930$
$0.(0_5)49689$
$-0.(0_7)14069$

Isobutylalk.	-80	33.7
	-40	27.0
	0	21.8
	20	20.0

Amylalk.	$-100°$	30.1	
	-50	23.0	
	0	17.4	0.824
	20	16.0	0.8107

$0.(0_2)089001$
$0.(0_5)065729$
$0.(0_7)118458$

Äthyläther	-80	7.05
	-40	5.67
	0	4.68
	$+20$	4.30
	$+60$	3.65
	$+180$	2.12

$\left.\begin{matrix} 7.05 \\ 5.67 \\ 4.68 \end{matrix}\right\}$ ~~Abw~~ Abweichg

$\left.\begin{matrix} 4.30 \\ 3.65 \\ 2.12 \end{matrix}\right\}$ Tangl

$a = 0.(0_2)151324$
$b = 0.(0_5)23598$
$c = 0.(0_7)400517$

Glykol (Walden)	20°		41.2
Dimethylsulfat	"	"	55.0
Furfurol	"	"	41.7
Benzonitril	"	"	26.5
Aceton	"	"	~~21~~ 21.5
Nitromethan	"	"	39.4

Nitrobenzol	-50	42.0
	0	41.0
	15	37.8
	30	35.1
	fest ($-10°$)	9.9

Abweichg. s. S.

Feste Körper — Phosphoroxychlorid 22° 12.7 Walden

Bei Gasen ~~Zustandsgleichg~~

$D = D_0 - \alpha t + \beta t^2$

$D_0 = 1.00993$

SO_2 $\alpha = 6.19 \cdot 10^{-5}$ $\beta = 186 \cdot 10^{-7}$ (Bädeker)

NH_3 $\alpha = 5.45 \cdot 10^{-5}$ $\beta = 259 \cdot 10^{-7}$ " !!

etc.

(Z. phys. Ch. 36, 305 1901)

Debye Ph Z nimmt: $\frac{\varepsilon-1}{\varepsilon+2} T = a + bT$ (anstatt $\frac{\varepsilon-1}{\varepsilon+2}\frac{1}{\rho} T$

Methylalk.	a = 18	b = 0.85
Äthyl.	20	0.82
Propyl	21	0.80
Isobutyl	29	0.76
Amyl	32	0.72
Äthyläther	80	0.25

$\frac{\rho_0}{\rho_{20}} = 0.01185.6$ / 313 / 36] ~~1.00...~~ 0.02371 / 1.02371

$\frac{34}{37}$ ~~273 : 332 ...~~

~~0.85 ... / 18+~~ $\frac{18 + 0.85 \cdot 273}{18 + 0.85 \cdot 293}$

3979
4265
0286

1068

4362 4669
9294 9294
3656 3963

232.05 249.05
18 18
250 267

5315 4800
4362 4669
9677 9469
−5682 −5211
3995 4258
3995
0263

R. Czukor Zur Th. d. Dielektrika Verh. D Ph G. 17, 73, 1915
M. Born 17, 204
R. Czukor 17, 214

Theorie ähnlich wie Ryzantowski aber 1). Eigenfrequenz d. Moleküle (nicht elastisch)
2). quantentheoretische Formel für die Temp. abhängigkeit.

W. Peddie Edinb. Proc. 32, 216–246, 1912, Beibl. 37, 518 1913

Molekulartheorie d. Magnetismus in festen Körpern

(Annahme dass alle Molekularmagnete gleichgerichtet) Systeme in homog. Anordnung berechnet Parallel u. Transversal Komp. des inneren Feldes (vernachlässigt höhere Glieder) und berechnet dies für verschiedene Krystallsysteme

R. Gans Zur Elektronentheorie d. Ferromagnetismus Beibl. 37 (1913) p 569 Gött. Nachr. {1910, 197–273; 1911, 118–164

Weiss'sches inneres Feld kommt etwa 10^4 mal grösser heraus als nach Analogie mit Lorentz' Theorie d. Dielektrika; Verf. nimmt statt dessen ein Feld von Konst. Grösse, welches beliebige Richtung haben kann (?)

W.E. Williams Ü. d. Anzug eines Kugel in einer viskosen Flüssigkeit Phil M. 29, 526, 1915

Beibl. 39, 330, 1915

vom Stokes'schen Regime bis zu großer Geschwindigkeit

Photographierung d. Stromlinien, u. theoret. Deutung der Asymmetrie bei großen Geschwindigkeiten

(infolge quadratischer Glieder) stimmen überhaupt überein.

D. Holde Elektr. Leitfähigkeit u. Zähflüssigkeit ... Isolatoren (Benzin etc.) Beibl. 39, 291, 1915

Chem. Ber. 47, 3239, 1914

R. Zsigmondy Ü. Koagulation Chem. Ztg. 41, 11, 1917

Referat o. ...

R. Gans u. P. Hertz D. Theorie d. Ewing'schen Modells eines ferromagn. Körpers

Z. f. Math. u. Phys. 61, 12, 1912 Beibl. 37, 1913

Änderung d. Magnetisierung eines Systems von ... Vertikalaxen drehbaren

Kompassnadeln ergibt Hysteresis u. jungfr. Kurve.

B. Cabrera u. E. Moles. D. Magnetochemie einiger Salze u. d. Th. d. Magnetons

Arch. d. Genève 35, 425–457, 1913 Beibl. 37, 1460, 1913.

zeitl. lang dauernde Veränderlichkeit (Abfallen der Kurven) bei Pascal-... Methode

unerklärlich! nicht die Verdünnung

[Ist das nicht Konzentr. Änderung ?] nimmt Veränderl.: d. ... ...

P. Weiss Ü. d. kin. Th. d. Paramagn. d. Kristalle CR. 156, 1674–1676, 1913

D. Magnetisierbarkeit d. Kr. u. d. Hyp. d. molek. Feldes CR. 156, 1836–1837, 1913

Beibl. 37, 1460–1463, 1913.

R. Gans Ann. 49, 149, 1916, Verh. D. Ph. G. 16, 780, 964, 1914

Gött. Nachr. 1.. (1910), 1.. 118 (1911)

Rosenberg K.

Einfache Versuche mit schallempfindl.

Gasflammen Zs. ch. U. 29, 181, 1916

Beibl. 40, 533, 1916

S. W. Young & L. W. Pingree D. Einfluss v. Licht auf d. elektr. Ladung suspendierter Teilchen

J phys Chem. 17, 657–674, 1913. Einfluss auf Wanderungsgeschw. von As_2S_3, $Fe(OH)_3$

Mastix, Harz, Chlorophyll, Bakterienemulsion

wahrscheinl. nicht infolge Koagulation sondern ... Ladungsänderung durch Belichtg

H. Nordenson D. Bedeutung d. Lichtes für d. Stabilität kolloider Lösungen ZS ph Ch. 90, 603, 1915

Beibl. 40, 571, 1916.

[illegible] - Sol koaguliert [illegible]. Also nicht erklärbar durch lichtelektr. Elektronen..emiss.! Scheint auf Störung d. Absorptionsgleichgewichtes zu beruhen

R W Wood & M. Kimura Zerstreuung u. regulärer Reflex [illegible] absorbierenden Gas Phil Mag. 32, 329, 1916

Beibl. 40, 567, 1916

(durch 2536 angeregt)

Resonanzstrahlung des Hg dampfes Maximum

bei 100° ($p = 0{\cdot}3$ mm) J_m

bei 150° $J = \frac{1}{2} J_m$

bei 200° ($p = 18$ mm) $J = \frac{1}{4} J_m$

bei 250° ($p = 76$ mm) $J = \frac{1}{10} J_m$

stets unpolarisiert (im Gegensatz zu J, oder Na dampf)

$\lambda < 2536$ wird stärker reflektiert als $\lambda > 2536$

(regulärer Refl. beginnt bei $p = 100$ mm

2536 bildet Doublet mit 0·03 ÅE Abstand

Literatur zu Lorentz-Glied $\frac{4}{3}\pi P$ (Natanson):

H.A. Lorentz: La théorie ... § 101–108 (1892)

Encykl. math. V 14, p 211–224 (1904)

Theory of Electrons p. 137–139, 303–306 (1909)

Larmor: Phil Trans 190² p 206,–299 (236–240) 1897

T.H. Havelock: Pr RS 77, 170, 1906; 80, 28, 1907; 84, 492, 1911.

Gans & Happel Ann. 29, 277–300 (283), 1909.

Natanson Bull. Crac. 1910, p. 268

Abraham Th. d. Elektr. II (1914) p 248–249

G.H. Livens Phil. Mag. 24, 268–293 (1912)

R. Gans Statist. Th. d. Dia- Para- & Metamagnetismus Ann. 49, 149, 1916

Kroo behauptet dass man Diamagn. ~~[illegible]~~ falls Elektronentheorie angenommen (& d. Einstein? was beides!)

Fehler darin dass er stat. Mechanik auf alle Koord. anwendet, während sie in Wirklichkeit nur auf die statist. Koordinaten anwendbar sind, nicht ~~auf die~~ z.B. auf Drehung um geometrische Figurenachse eines Rot. körpers. Ein solcher Rot. Körper strahlt keine Energie aus.

Derartige Magnetone mit Figurenachse geben Paramagnetismus (nebst immer vorhandenem Diamagnetismus). Unter Umst. kann infolge Abh. von Temp. & Feld ein Übergang von ~~Dia~~ Para in Diamagnetismus (= Metamagnetismus) stattfinden

---

Lenard Ü. Wasserfallelektr. & [illegible] Ann 47, 463, 1915

R Gans Ü. Paramagnetismus Ann. ~~49~~ 50, 163, 1916

— D. Koerzitivkraft v. Stahl & Eisen in ihrer Abhäng. von d. Temperatur Ann 48, 514, 1915

F.A. Holm Ü. eine modifizierte Fassung d. Hypothese d. molek. Umdrehung u. d. Äquipartitions S. d. kinet. Energie. Ann 48, 433,)))!

— Anwendung d. Curie-Langevin'schen Magnetisierungsgesetzes für die molek. Drehungen 47, 1, 1915

Landolt-B. p 1220 Dielektr. konst. (Ratz) $D = D_0 - \alpha(t-\vartheta) + \beta(t-\vartheta)^2$

Zeitschr. ph. Ch. 36, 305, 1901.

SO_2	$\alpha = 6{\cdot}19 \cdot 10^{-5}$	$\beta = 1{\cdot}86 \cdot 10^{-3}$	$t =$ 0–110	ϑ 0
Äthylchlorid	8·75	2·06	10–150	0
NH_3	5·45	2·59	10–110	$\vartheta = 20$
$CHCl_3$	2·1	0·8	100–140	120
CH_3OH	4·65	3·5	90–150	110
C_2H_5OH	5·48	4·78	110–150	110
$(CH_3)_2O$	4·46	1·27	10–150	0
$(C_2H_5)_2O$	2·14	0·70	70–150	100
C_6H_6	1·1		110–140	110

S. auch Eversheim Ann 8, 539, 1902
13, 492, 1904

Schaefer u. Schmidt J. ph. Chem 13, 669, 1909; 16, 253, 1912.

Burgers J.M. Die adiabat. Invarianten bedingt period. Systeme Ann. 52, 195 1917

Beweist dass unter B. Bed. : bedingt periodischen Systeme durch die Existenz adiabatischen Invarianten $\oint p\,dq$

[illegible]

R. Gans Ü. d. Form ultramikroskop. Goldteilchen Ann. d. Phys. 37, 881, 1912

Rayleigh's Kunstgriff : D. elektr. Feld im Innern d. Ellipsoids wird als quasistatisch angesehen
(Phil. M. 44, 28, 1897)

n^2 = Dielektr. K. m_0^2 gleich d. Feld $\mathfrak{E}_0$

$$E_\xi = \frac{E_{\xi 0}}{1+\frac{m'^2-1}{4\pi}P} \qquad m'^2 = \frac{m^2}{m_0^2}$$

$$E_\eta = \frac{E_{\eta 0}}{\dots}$$

$$E_\zeta = \frac{E_{\zeta 0}}{\dots}$$

$$P = 4\pi\,\frac{1-e^2}{e^2}\left(\frac{1}{2e}\lg\frac{1+e}{1-e}-1\right) \qquad e=\frac{\sqrt{A^2-B^2}}{A} \qquad P' = 2\pi-\frac{P}{2}$$

$$= \frac{4\pi}{e^2}\left(1-\frac{\sqrt{1-e^2}}{e}\arcsin e\right)$$

Polarisation = induz. elektr. Moment d. Volumeinh. d. Ellipsoids = $\mathfrak{P} = \frac{m^2-m_0^2}{4\pi}\mathfrak{E}$

R Emden Üb. Strahlungsgleichgewicht u. atm. Gz. (?) Münch. Ber. 1913, 55–142

Ref. Met Z. 30, 452–454, 1913 · i. [illegible] [illegible]

[illegible] i. obersten (feinig) (?) Schichten [illegible]

Poincaré Letzte Gedanken (?) 261 S. M 5.50 Akad. Verlags 1913

Fürst B. Golitzin Vorlesungen ü. Seismometrie Herausgeg. v. O Hecker · 538 S. Mk. 22.– TB 1914

G W Walker Modern Seismology XII + 88 Longmans Green & Co 1913. 5s/–

29). Ruchy Browna pod wpływem elektronów, wyprowadzić uwzględniając odbicie

30). Rotacje Brownowskie zmodyfikować przez postawienie wszystko prosto ponad albo pod wodą.

31). Teoretyczny wzór $e^{-\frac{N}{RT}X(z)}$ uogólnić i uściślić

32). Obserwacja fluktuacyj cząstek magnetycznych!

33). Czy prawda że w ośrodkach elektrycz. (magnetycz.) ani śladu histerezy
natomiast występuje gdy [illegible] [illegible]

Jak pogodzić teoretycznie histerezę z fluktuacyami?

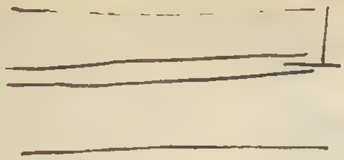
Dopóki cząstki bardzo oddalone, tak że wzajemny wpływ drobne, nie ma histerezy } ?
Powstaje wskutek oddziaływania sąsiednich cząstek

34). Podobnie w polu elektrycznem powstawanie linij sił (Seddig etc) wskutek wzajemnego wpływu cząstek. (Związek z Formelung „łańcuchowem" powstawaniem [illegible].)

35). Obserwacja nierównomierności ~~[illegible]~~ liczby cząstek koloidu w polu magnetycznem jako środek do oznaczenia K.

36). Nalewając parę eteru na wodę przyprószoną proszkiem Lycopodii wywołują się gwałtowne ruchy ~~[illegible]~~ z powodu zmniejszenia napięcia powierzchni. Czy nie powinno nastąpić coś analogicznego w razie większego ogrzania cieczy? Jeśli nie, to wyjaśnić związek nap. pow. z owymi [illegible].

37). Powtórzyć moje dawne doświadczenia nad [illegible] ciepłem proszku Ag (Kohäsions effekt)



$$V = \alpha \lg r + \beta$$

$$V_0 = \alpha \lg R + \beta$$

$$V - V_0 = \alpha \lg \frac{r}{R} \qquad \alpha = \frac{V_1 - V_0}{\lg \frac{r}{R}}$$

$$\frac{dV}{dr} = \frac{\alpha}{r}$$

$$-4\pi\sigma = \frac{V_0 - V_1}{r \lg\left(\frac{R}{r}\right)}$$

N. p. $r = \frac{1}{100}$ mm $= 10^{-3}$ | 10^{-4}

$R = 1$

$$\sigma = \frac{1}{4\pi} \frac{V_1 - V_0}{10^{-3} \cdot 3 \cdot 2{\cdot}4} = 10 \underbrace{(V_1 - V_0)}_{10.000 \text{ Volt}} = 300$$

$3 \cdot 10^{3}$

$$\boxed{8\pi\sigma^2 = 25 \cdot 9 \cdot 10^{6} = 20 \text{ atm.}}$$

$$n = \frac{2r\pi\sigma}{r^2\pi \cdot 4{\cdot}8 \cdot 10^{-10}} = \frac{2\sigma}{r} \cdot \frac{10^{10}}{4{\cdot}8} = \frac{600 \cdot 10^{10}}{4{\cdot}8 \cdot 10^{-3}} = 1{\cdot}2 \cdot 10^{15}$$

$1{\cdot}2 \cdot 10^{17}$

9410
II

PPv Weimarn Beiträge z. Natur d. dispersen Systeme Z phys. Ch. 76 p. 212–230 (1911)

Tangl Expon. d. Oberfl. Spannung ... Ann Ph 34 p 311 (1911)

Nilltschus ... Dielektr. ... Ionen dissoz. ...

J. r. phys. ch. S. 42 phT. p. 367–374 (1910)

~~Cybulski & D. Dorkowski ... Bull. 1909 (660–689)~~

Pionchon Sur un effet électrique du déplacement relatif d'un métal et d'un électrolyte

en contact CR 153 p. 47 (1911)

~~Krakau Z ph Ch 39 p 225 (1902)~~

~~Freundlich & Mäkelt Z f Elektroch 15 p. 161 (1909)~~

Heydweiller Ann d Ph 28 p. 512 (1909)

Mc Lewis Phil Mag 19 p 573 Koll Zschft 4 p. 211 (1909)

Gouy Sur la théorie de l'électrocapillarité CR 146 p. 612–615, 1374–1376 (1908) 147 p. 92 (1908)

Möller Überspannung, Gasabscheid. ... Ann. 25 p 725–744, 27 p. 665–711 (1908)

Fortsch. 1909 p. 556

entsprechend ... für Saltpeter d. ...

Tropfelektroden ... Kapillarelektrometer

Pot diff ... Metalls ... Elektrolyt ...

wenn Kapillarspannung d. Elektrode ein Maximum hat

Dygen Billitzer Z f Elektrochem. 14 p 624–630 (1908)

A Mayer & E. Salles Sur le transport électrique des colloïdes inorganiques CR 146, 826–829 (1908)

Krüger J d. d. Radioakt 2 p. 68 (1905) Th d. Elektrocapillarität

Galecki Rostwory Koloidalne Kosmos 1909

Roiti } Bibl. 4 p. 68
Gomez } 68

~~Tissot Journ chim phys. 2 p. 601 (1904), 3 p. 50 (1905)~~

~~Overton ... 11 p. 440 (1906), 12 472 (1906)~~

Baudouin CR 138 p. 898 (1904) 1105 – 1103

Pictet Lieder 71, 568 (1897)

Ascoli CR 137 p 1253 (1903)

Cotton & Mouton CR 138 p 1504 (1904) J d. chim phys. 4, 365 (1906)

Knoblauch Z ph Ch. 39 p 225 (1902)

Svedberg Koll Zeitschr 1 161 (1906) Freundlich p. 328

~~Schwarz Ph Z. (1905) p 6~~ Schwarz Ann d Ph 18, 13 (1905)

Hardy Z ph Ch 33 p 385 (1900); Beltz B. d. d. ch. Ges. 37 p. 1095 (1905) Z f Elch. 14, 567 (1908)

Graf Schwerin: Z f Elektroch. 9 p. 739 (1903) Bulle Poulet IV1 p. 619

G. Girard Sur le rôle prépondérant de deux facteurs électrostatiques dans l'osmose des solutions d'électrolytes. Mouvements osmotiques normaux CR 153 p 401–404 (1911)

P. Kandidow ... J. russ ph ch. S. 43 ph. T. p. 143 – 147 (1911)

Dorman Z Elektroch. 17 p 572 (1911)?

Anderson & Bowen Measurement of Contact Diff. of Pot. Phys S. June 6 (1911)
Chem News 103 p 311 (1911)
Nature 86 p. 607 (1911)

C. Christiansen Experimentalundersøgelser om gnidnings-elektricitets oprindelse III Overs. Vid. Selsk. Forh. Kbh. ~~1911~~ p. 209 ~~...~~ 1894 p 189 Christiansen

L. Riéty Force électromotr. produite par l'écoulement d'une solution de ~~sel~~ $CuSO_4$ dans un tube capill.

A. Ryckler L'électrophorèse du noir de fumée J. chim phys 9 p 382 – 398 1911 CR 152 p. 1375 – 1376 (1911)

Gouy Sur la constitution de la charge électr. à la surface d'un électrolyte Bull SF. Ph. 1910 ~~...~~

~~De Broglie CR 152 p 696 1911~~

Wo. Ostwald ... Elektrolyse ... Ultramikroskop Z f. Kolloid 7 p 132 1910, Bibl. 58 p 370

Ann d Ph 66 p 1191 (1898) ... ibid. p. 535 134

A. Coehn u. U. Raydt Quantit. ... Dielektr. Ann d Ph. 30 p 777-804 (1909)

Z. Elektr. 16, 586-591 (1910) Sitz. Nachr. 1909, 263-288

Bunsen Gesellschaft 1911 Z. f. Elektroch.

Morris Owen Frictional Electricity Phil Mag 17 p 457-465 (1909)

Fr. Fabinger Cas. 38. 439-445 (1909) Böhmisch Fortschr 1909 II p 39

Hg rein filtriert durch Leder wird + el.

Hg Amalgam (Pb) - — — Filter selbst +

C. Christiansen Experim. ... Elekt.

Overs. danske Vid. Selsk. Forh. 1909 p 581-601 (Dänisch) Fortschr. 1909 II p 39

...

14 Tabellen Reines H_2O macht 1). Harz, Pech, Wachs, Ceresin; Lack stark negativ

2). Paraffin, Spermacet, Schellack, Collodium, schwach "

sehr verdünnte Säure u. Salzlösungen wie (2) gegen negativ (1) ...

Maximum bei Concentr. 10^{-4} normal

bei grösserer Konz. wird e Isolatoren positiv in Säuren

Maximum posit. Ladung bei starken Säuren für 10^{-2} norm Konz.

β). in Salzen nimmt neg. Ladung ab, wird aber selten +

γ). Basen benetzen gründlich die Isolatoren wodurch die Resultate inkonstant werden

---

Dispeaux Electricité de contact Bull. S. F. Ph 1908, 43 Fortschr 1908. II 43

A. T. Cameron u. E. Oettinger: On the Electromotive Forces prod. by Acid & Alkaline Solutions streaming through Glass Capill. Tubes Phil Mag. 18, 586-603, 1909

Chwolson Lehrb. d. Ph. IV/1 p. 577 Ele End. ; CO₂ nep. 12

elecktro
Entdeckt durch Reuss (1807) in Moskau Mém. d. l. soc. Imp. d. natural. à Moscou 2 p. 327 (1809)

bestätigt durch Porret Thomson's Journ. 1816 July

Gilb. Ann. 66 p. 272 (1820)

A. Becquerel Traité de l'électr. 3 p. 102 (1835)

Wiedemann ausführlich, Quincke, Freund

Van der Ven : [illegible]

[illegible]

transportiert werden :

Arch. Néerl. 6 p. 127 (1901) Arch. Mus. Teyl. 8 p. 93, 199, 363, 390, 489, (1901) (1903)

9 p. 97, 217, 573 (1904/5) 11 p. 105 (1918)

Tereschin W. Ann 32 p. 333 (1887)

Cruse

Bewegung suspend. Theilchen : Reuss, Faraday Exp. Res. Ser. 13. (1839)

Armstrong P. Ann. 60 p. 354 (1843) Ph. M. (3) 23 p. 199 (1843)

Helmholtz, Dorn, Lamb, Smol.

Ibidem p. 257 [illegible]

Quincke, Zöllner Pogg. Ann. 148, p. 640 (1873)

Haga W. Ann. 2, 326 (1877) ; 5 p. 287 (1878)

Elster " 6 p. 553 (1879)

Clark 2 p. 335 (1877)

Dorn Pogg Ann 160, 56 (1877) ; 5 p. 29 (1878) ; 9 p. 517 (1880) ; 10 p. 70 (1880)

Edlund P. Ann. 156 p 251 (1875); W. Ann 1 p 184 (1877); 3 p. 489, (1878),
8 p 127 (1879); 9 p 95 (1880).

Gouré de Villemontée: Journ phys. 6 p 59 (1897); Écl. él. 8 p. 491 (1896).

Helmholtz: W. Ann 7 p 351 (1879); Ges. Abh 1 p. 855

Reibungselektrizität p 241 p 243

Faraday: + Fell, Flanell, Elfenbein, Federn, Bergkrystall, Flintglas, Baumwolle, Seide,
Holz, Lack, Metalle, Schwefel −

mattes Glas − × geriebenes Glas +   Schiessbaumwolle −

Heschus: Journ phys ch. G. 33 p. 1, 48, 77, (1901); 34 p 1, 15, 25 (1902);
35 p 478, 482, 575 (1903); 37 p 29 (1905)

[illegible] Seweszewski [illegible] 2 chemisch gleichartige [illegible]

[illegible] [[illegible] oder Dynamisches]

[illegible] Dielektr. [illegible] Härtegrade + Diam (10) Topas (8), Bergkrystall (7),
poliertes Glas (5), Glimmer (3), Kalkspat (3), S (2), Wachs (4) −

Heschus nach Theorie (Elektronen)

Ebert & Hoffmann Ann 2 p 706 (1900) [illegible]

etc. etc.

Kontaktelektr. ...... p. 227   Dielektrika: J Thomson Pr RS 25 (169) (1876)
Ph M 3 p 389 (1877)

Ayrton & Perry Pr RS 27 p 219 (1878)   Knoblauch Z ph Ch 39 p 225 (1902)

Hoorweg W Ann. 11 p 144 (1880)

Camann & Öttinger $E = \frac{P}{4\pi\eta K} (\varphi_i - \varphi_a)$ / absol. electrostatic units!

All previous exp. (Dorn, Elaund, Lothe etc.) consider $\varphi_i - \varphi_a$ as a constant

Helmholtz & Dorn calculated $4D = 5{\cdot}1$ Volt (which seems a rather large value for the potential between glass ~~water~~ and, considering the fact that much smaller potentials, so far as we are aware, always produce development of H_2 gas (See table of absolute pot. by Wilsmore & Ostwald Ztschr. Ch. 36 p. 92 (1901) Billitzer's absol. zero point Ann. 11 p. 137 (1903) although different, is still near enough to Ostwald's for the validity of the above conclus.)

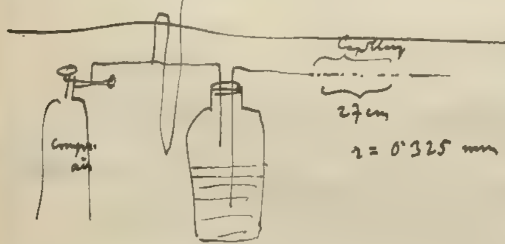
Much smaller values strikingly altering with the concentr. of the solution have been derived from the electric endosmose experiments of Wiedemann, Quincke, Freund, so that one point of the theory still unsettled.

A way of access to the pot. diff. glass/solut.: Haber & Klemensiewicz Ztschr. Ch. 1909

Glass acts like a hydrogen electrode

	for normal ionic conc.	$\frac{1}{100}$ n	$\frac{1}{1000}$ n
Ions	14. 0.058 = 0.812 V	10. 0.058 = 0.58 V	8. 0.058 = 0.464 V.

$\varphi_i - \varphi_a$ ought to increase by increase of hydroxyl
decrease " hydrogen



$r = 0{\cdot}325$ mm

difficulty: 1). disturbance by electrodes
2). change with time (Clark, Dorn)
3). pressure not used up kinetic energy (Poiseuille's law not valid for greatest pressures)

Temp 21° - 32° only 3% diff

preliminary experim. proved approximate constancy of $\frac{E}{P}$ (indep. of length, time) ~~Ablesung~~ 71.2 not Kelvin't changing

solutions between $\frac{N}{1500}$ - $\frac{N}{5000}$ used (prepared synthetically) ~~more~~ concentrated gave too small E
diluted " too uncertain conductivity

definitive experiments with new tube $l = 25{\cdot}6$ cm
$r = 0{\cdot}364$ mm

		$\varphi_i - \varphi_a$	$\frac{1}{\kappa}$
HCl	$\frac{N}{5000}$	4·60 4·26	$0·1283.10^5$
	$\frac{N}{5000}$	4·11 3·52	0·1341
	$\frac{N}{2500}$	2·80	0·0684
	$\frac{N}{2500}$	3·18 3·23	0·0652
	$\frac{N}{1250}$	4·22	0·0314

		$\varphi_i - \varphi_a$
CH_3COOH	$\frac{N}{2000}$	3·95 4·20

"we think we are entitled to lay less stress both on the higher value for the $\frac{N}{1250}$ and on the smaller for $\frac{N}{2500}$ etc"

In any case it seems evident that $\varphi_i - \varphi_a$ for acids < 4·5 Volts

NH_4OH	$\frac{N}{5000}$	5·45 4·72
	$\frac{N}{2500}$	5·37
	$\frac{N}{2500}$	5·35
KOH	$\frac{N}{2000}$	7·23 6·44

mean (perhaps probably) 5·5 Volts

value for "pure" water given by Helmholtz & Dorn = 5·07 Volts

KCl	$\frac{N}{2000}$	4·73 4·83

∴ value 5 Volt for water seems correct and then $\frac{\text{acid}}{\text{alkali}}$ change is $\frac{-}{+}$ 0·5 Volt

thus sign of change is the expected one but the magnitude is three times larger than theory predicts

this unexplained by Helmh. theory

Knoblauch Zeph Ch 39 p 225 1902, Perrin Franklin & Maskell

From Perrin's result it would follow that pure water does not show any pot. diff against different insulators which is in contrast with our and Dorn's results. Change of sign if alc. acid is used, is in agreement

Theory of Perrin also quite different, it recalls some results obtained by Rutherf with ionised gases passing by metallic tubes and explained by differ of coeff of diffusion etc. interesting discussion

A. Coehn Z. f. Elektrochemie 4 p. 62 (1897) d. Elektrostenolyse
Ann. 64 p. 217 (1898), 66 p. 1191 (1898) Z ph Ch. 25 p. 651 (1898)

Hydrozellen Ann 66 p. 535 (1898)

Kapillar Elektr. p. 201–212 Doppelschicht

u. A.: Planck W. Ann 32 p. 488 (1887) 40 p. 561 (1890) 44 p. 385 (1891)

Smith Ph. R. 5, 398 (1903)

Palmaer Z ph Ch. 25 p. 265 (1898), 28 p. 257 (1899), 36 p. 664 (1901)

Gouy

Lorch

Billitzer Wien Ber 111, 1393 (1902) 112, 1553, 1586, 1734 (1904) 113, 637 1159) (1904)

~~Ann 11 p. 902, 937 (1903)~~, 13 p. 827 (1904)

Z phCh 45 p. 307 (1903); 48 p. 513, 542 (1904)

49 p. 709 (1904) 51 p. 129 (1905) p. 167 (1905)

Z f. Elektrochem. ~~15 p. 160~~ 439 (1909); 8, 638 (1902); koll ZS 1, 225 (1907)

Christiansen Ann Ph 16 p. 382 (1905)

St. Meyer

Van Laar Ph Z. 4, 326 (1903) Z ph Ch 41 p. 385 (1902)

Krüger Z ph Ch 45 p. 1 (1903) Gött Nachr. 1904 p. 33

etc etc.

Vining Ann Physik 9 p. 272 (1906)

Kataphorese: Whitney & Blake J. am. ch. Soc. 26 p. 1339, 1358

Freundlich p. 340, 338

Linder & Picton J. Chem Soc. 71, 568 (1897) 61, 148 (1892) Wied p. 240

(Duclaux J d chim ph. 5, 29 (1907))

Lottermoser Z ph Ch. 60, 451 (1907, 62, 359 (1908)

~~Stenberg Ann 26 p. 329 (1908)~~

~~Diethold Z ph Ch. 60 p 302 (1907)~~

Biltz Ber. D ch. Ges. 37 1095 (1904)

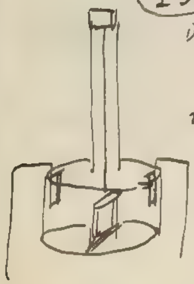
Svedberg Nova Act. R. S. Upsal. 2 p. 153 (1907)

Quincke Pogg Ann 113 p. 513 (1861) Wied Ann 87 321 (1852)

541 99 189 (1856)

Oellektur Ostw. Ann 11 p. 902 – 936 p. 937 – 956 7/03

El. Doppelschicht u. absolutes Potential | [illegible] |
(I. [illegible])



1). Feine Metalldrähte [illegible] 10 – 220 Volt

2). 125 [illegible] ([illegible] KCl) [illegible] Commutator [illegible] Pot. diff. ([illegible])

3). [illegible]

Wenn Umkehrung [illegible] Kalomel elektrode [illegible]

EMF [illegible] Kalomel [illegible] [[illegible]

Pot diff. [illegible] Pot diff. [illegible]]

[illegible] Pot [illegible] ~~[illegible]~~

[illegible] abs. Pot.: Hg – Kalomel

Pt zeigte sich negativ in Luft, O_2, H_2O, C_6H_6, $C_6H_6 + HCl$, Aceton, Xylol, H_2O + Spur Säure, Base, [illegible]

positiv H_2, Methylalk. Äthylalk. Glycerin, Äther, Formaldehyd, Acetaldehyd, Benzaldehyd, $KMnO_4$, H_2O_2, $CHCl_3$, etc.

Aber Reihenfolge [illegible] Konzentration [illegible] Pt + ganz konz. Formaldehyd ([illegible])
– verd.
+ Alk.
– verd. Alk.
+ [illegible]
– verd. [illegible] } warm

Pt dient als Kathode [illegible] H_2 [illegible] neg. [illegible]

Anode [illegible] { neg. alk. ; pos. [illegible] }

So wurde [illegible] oxyd. od. [illegible] Pt [illegible] O_2 oder H_2 beladen und Nullpunkt aufgenommen

(Pt) $FeSO_4 + Fe_2(SO_4)_3$ Ox. [illegible] Kalomelelektr.

	+0.12 V.
Formaldehyd	+0.125
Äthylalk.	+0.147 ?
H_2O_2	+0.125

[illegible] ? [illegible] Lösung [illegible] Wilsmore [illegible] 25 p. 291 (1900) (318)

[illegible]

(Ag) Ag NO_3 Hg_2SO_4 [illegible] KOH

Ag Ag NO_3 [illegible] HCl [illegible]

II Methode
Fehlerquelle Veränderung [illegible] Lösung [illegible]

[illegible] Koll. Lösung!

Kataphorese von

Koll. Pt H_2O + Formaldehyd $Fe_2(SO_4)_3 + FeSO_4$ [illegible]
K [illegible] H_2O_2

				Hg KOH [illegible] Kalomelelektr.	[illegible]	[illegible] Hg [illegible]
Hg	HgNO_3	KOH	[illegible]	0.49	Kat	+
				0.40	"	+
Ag	AgNO_3 [illegible]			0.36	"	+
				0.21	"	+
Au				0.18		–
				0.11	An	–
Pd				0.08	An	–

III Metall Ströme durch fallende Metallpulver, folie, draht

Röhre in vertikaler Lage beim Umlegen Ströme von 10^{-5}–10^{-6} Amp.

Ag pulver von Heraeus (frei d. meisten Metallen, aber feinkörnig)

f Ag elektrode a Ag NO_3 aq

Potential gegen 0·1 Kalomelelektrode	Ag in Lösung
0·46	+
0·40	+
0·32	+
0·20	+
0·18	+
0·10	−
0·04	−
0·00	−
−0·05	−
−0·08	−

Zusatz v. KCl + NH_3 [illegible] (oder KBr, KJ)

Pt Au Ag (Cu?) [illegible]

Thoma Einwände gegen Helmholtz Th. ~~[illegible]~~ unverständlich!

schlägt daher eine Modifikation vor: dass die Belegungen nicht entgegengesetzt gleich sind

Wiedem. p. 932–933

Nehmen wir z. B. eine Ag Elektrode in Ag Lösung an; [illegible] Ag-Ionen [illegible]

+ Ionen [illegible]

[illegible]

[illegible] elektrisiert [illegible] Diff. [illegible] $E = R\theta$ [illegible]

[illegible] elektrisiert wäre; [illegible]

[illegible]

[illegible] neutralisiert [illegible]

[illegible] Kation [illegible] || Also Umkehrpunkt = −0·4 V bezogen auf H = 0
= 0·75 [illegible]

p. 937 [illegible] [Drude Wied. Ann. 10, 70 (1880) [illegible]]

[illegible] Pt Spirale [illegible] Ag [illegible]

80 cm [illegible] 37 mm [illegible] ; $AgNO_3$ [illegible]

[Kein Thermo [illegible]] [Kein [illegible] 20 [illegible]]

[illegible] ; contact [illegible]

[illegible]

$AgNO_3$ (0.01-n) $w_f = 8.13\ \Omega/cm$

l	i gef.
77.3	7.2 – 7.5
37.3	10.2 – 10.3
17.0	16.8 – 17.2

[illegible] verdünnt $w_f = 10766\ \Omega/cm$ $w_a = 200\ \Omega$

l	i
76.5	1.2
37.3	2.0
17.0	2.9 – 3

[illegible] 50%

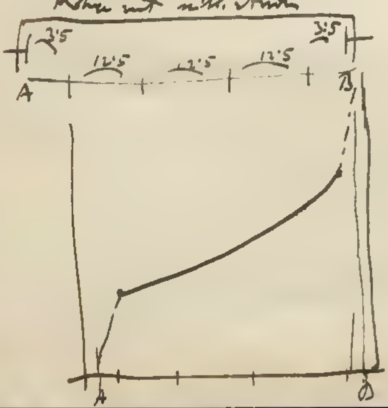
Bei Vorschaltung [illegible]:

$w_f = 11.74\ \Omega/km$ (1-n) $w_a = 5200\ \Omega$

l	i
77.3	35.1
37.3	32.1
17.0	25.8

[illegible] Pt Spirale 1 – 10 cm/sec

Röhre mit mittl. Strecke



Entstehung [illegible]

[illegible] Strom [illegible]

[illegible]

[illegible] Strom [illegible]

Dimension [illegible]

[Strom mit bleibt dauernd stunden, je [illegible]!]

Kolloid Temp. Einfluss:

$w_p \neq 0$ $w_a = 100200\ \Omega$

θ	18	28	38	48	58°
i	7	15	28	50	94
Verh.	1	2·1	4	7·1	13·4

Siehe Ionisationskonstante d. Wassers Hydroxyllen!

Kein Einfluss d. Fallgeschw. d. Dichte [illegible] bei Neigung und langsamem Schütteln,

[illegible] $=\infty$ [illegible]

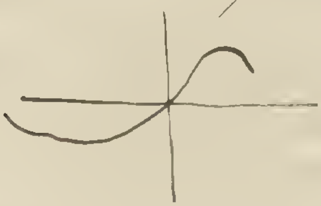
Feine Silberdraht [illegible]:

		i
Dg d ca	1 mm	30
	0·65	52
	0·05	82

[illegible] Cu [illegible] ~ 20 / [illegible] 20 [illegible] Effekte]

[illegible] absol. Ost diff.

„Abs Ost." (bezogen auf Schüttelgefäss = 0)	+ 0·389	0·25	0·20	0·07	− 0·13	− 0·24	− 0·55
i	1·8	3	8	7·3	9·5	7·7	8
Verh. der i	1	1·7	4·4	4	5·3	4·3	4·4



Ähnlich [illegible] Resultate [illegible] J. J. Thomson [illegible]

[illegible]

$$i = \frac{K(\varphi_1-\varphi_0)}{4\pi}\frac{M_f \cdot 6}{\eta}\frac{1}{L6 + W_a}$$

wenn $L6 < W_a$ $\quad i = \frac{K(\varphi_1-\varphi_0)M_f 6}{4\pi\eta}\frac{1}{W_a}$

$L6 > W_a$ $\quad i = \frac{K(\varphi_1-\varphi_0)M_f}{4\pi\eta}\frac{1}{L + \frac{W_a}{6}}$

Schuster [illegible]

Ann. 58 p 417

(1880)

Reibungs Elektricität:

Christiansen Ann. 53 p 401

56 — 644 — [illegible]

57 — 682

Wesendonck 58 — 44 | 62 545

69 661

Warburg 54, 407

Roever 57, 397 El. Ind. [illegible]

Mann 63, 324

Riess 27, 204

Christiansen 12 1072

Lenard 5, 779

Holtz 21, 380

$\frac{v}{v_{D+}} = 2247.10^3$

$\frac{6.10^4}{2 \cdot 2.10^6} = \frac{3}{1 \cdot 1} . 10^{-2}$

$300 : 1 \cdot 1 = 273$ 　 7%

$\frac{17}{12} . 17$ 　 $\frac{17}{119}$ $289 : 12 = 24$ 　 $\frac{41.17}{12}$ $\frac{41}{287}$ $697 : 12 = 58$

<u>Rietz</u> Force électrom. prod. par l'écoulement d'une solution de sulfate de cuivre dans un tube capillaire CR 152 p 1375

Quincke, Helmholtz

Gouré de Villemontée J d Ph 6 (1897) p. 59, Éclairage électr. 8 (1896) p 491, 579

opérant sur des liquides conducteurs (Hg, solutions salines) s'écoulant sous des pression → 3 atm. n'a pas obtenu

de résultat

Tube capillaire de très petit diamètre mastiqué sur réservoir d'un tube de Cailletet réservoir rempli de sol CuSO₄ et enfermé dans pompe Cailletet. Électrode en Cu communique avec l'extérieur. Tube cap. 2 fois recourbé à angle droit, plonge par son extrémité ouverte dans un vase rempli de sol CuSO₄ où a cond. électrode en Cu.

Deux bornes réunies à électrom. capillaire ; pot. à la sortie > entrée

(composé à l'aide d'un potentiomètre) ∴ transport de él. posit. dans le sens du courant

sol 10 g CuSO₄ / litre

I).

P = diff de pr	v diff de pot. (Volt	$\frac{v}{P}$
5 atm.	0·00186	0·00037
10	37	37
15	55	37
25	93	37
35	130	37
52·5	186	35
70	242	35
85	279	33
90	298	33

(Compl. V)

comme dans le cas des liquides pas conducteurs

$\Delta p = 4\pi \gamma \frac{\mu v}{P}$

$= 4\pi . 0·010 . 0·012 . 10^{-4}$

$. 9 . 10^{11} . 10^{-6}$

$= 4\pi . 0·01 . 1·08 = 0·13 V!$

0·017

II).

gr. de CuSO₄ (cristt) par litre d'eau	$\frac{v}{P}$	conduct. spécif. γ $\frac{cm}{ohm}$	$\frac{\gamma v}{P}$
20	0·00019	62·2 . 10^{-4}	0·0118 . 10^{-4}
10	35	36·8 10^{-4}	128
5	60	20·6	123
2·5	79	12·5	10
2	0·0012	10·1	12
1·25	25	6·8	17
1	71	5·9	41.

donc diff de pot. rapportée à 1 atm. diminue lorsque le nombre de grammes de CuSO₄ augmente

Vraisemblablement constant pour sol. assez concentrées

Moglie CR 152 p. 696

Sur l'abaissement des diff de pot de contact apparentes entre métaux par suite de l'enlèvement des couches d'humidité adhérentes

~~Lavage à~~ Cuire dans l'huile de vaseline ou décaper avec toile d'émeri et papier dans enceinte remplie d'air desséché

Diff. de pot. diminuent de 1 Volt à quelques 0'01 V

Ag, Pt, Fe, Cu Zn Ni Pb, Sn, Bi, Al

donc la plupart des diff. pot. apparent est due à la couche d'humidité.

(CR 150 p 1145)!

Ouel Ann. d. Ph. Avril 1910

Girard CR 148 p 1047 (1909) 153 p 401 (voir CR 4 Juillet 1910)

19

osmose au moins dans le cas des sol. d'électrolytes est essentiellement électrostatique

Si deux solutions séparées par tube capillaire la double couche H à la surface du tube et la diff de potentiel des liquides ("champ actif") produisent osmose (qui peut masquer complètement l'effet des pressions osmotiques)

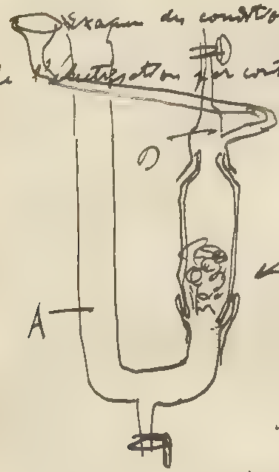
vessie de porc

solutions isotoniques 2'5 - 3 atm. par cm²

Liqueurs isotoniques	Signe de la veine liquide	Δ de pot. corresp. au champ actif	orientation du champ	sens de l'osmose	mouvement osmotique en dmm
1). KCl NaCl		0			
2). KCl Na_2SO_4		0			
3). $MgSO_4$ Saccharose		0		↑	33
4). Saccharose Acide tartrique	−	0'058 Volt	∓	↓	10
5). " $Pb(NO_3)_2$	−	0'040	∓	↓	30
6). " K_2CO_3		0'060	±	↓	20
7). Ac. tart. Na_2SO_4	±	0'060	∓	↓	

Perrin CR 137 p. 1388 (1903)

Examen des conditions qui déterminent le signe et la grandeur de l'osmose électrique et de l'électrisation par contact



Gewöhnliche Pfropf
darauf die mit Wasser angefeuchtete Drei
geschüttet Wasser abgezogen, wieder Drei aufgeschüttet
was sie bis sich ein Pfropf bildet

was für eine Substanz? nicht gesagt

grand K { 1). osmose notable avec l'eau, alc. méth., alc. éthyl., alc. amylique, acétone, acétate d'éthyle, nitrobenzène

aucune osmose appréciable même pour des champs $\frac{100 \text{ Volt}}{\text{cm}}$ dans le cas de la benzine, térébenthine, éther, éther saturé d'eau

∴ l'osmose n'est intense que pour les liquides ionisants

2). sensibilité extrême aux moindres traces de certains électrolytes

$P = E \frac{K}{4\pi\eta} W (\varphi_1 - \varphi_2)$ $\qquad \frac{2E}{\kappa^2 r}(\varphi_1 - \varphi_2) K$ $\qquad 10^{1} \frac{1}{(300)^2} \frac{}{10^{-12}}$

[illegible]

E. van der Ven, Sur le transport des liquides par le courant électrique

Arch. Musée Teyler (2) 11 p 185–218 (1908) Fortsch. 1908 1 p 503

Fraser & Holmes Electric Osmose Am. Ch. J. 40, 319–325 (1908) "

Bestimmt wurde El. Endosmose der 0.001 norm Lösungen von $K(NO_3)$, Na, NH_4, Li, Cs, Rb,

Tondiaphragma [illegible] Ba, Sr, Ca

[illegible] [Am Ch. J.] 36 p. 28 [illegible] (Kation : Wertigkeit)

[illegible] NH_3 [illegible] CH_3COOH [illegible] negat. Osmose

Was für Scheidewände ??

O. Curie U. d. Osmose Diss Münster 1908 (60 S.)

[illegible] Hittorf [illegible] [Fortsch 58 p 665 (1902), 59 p 445 (1903)] [illegible]

[illegible] electr. Osmose [illegible] konz. [illegible]

[illegible] El. [illegible] Scheidewand [illegible] (präpariertes Hammelblase). [illegible] Hittorf

[illegible]

Resultat: Hittorf'sches Schlierenphänomen = sekundäre Wirkung d. electr. Osmose.

Mit Ausnahme d. konz. $CdCl_2$ – Lösung [illegible] konzentr. Lsg. d. [illegible] el. Osm.

[illegible] Scheidew. [illegible] Perrin [illegible] Cr_2Cl_3.

Bouillaume CR 147 p 53–55 Perrin CR 147 p 55–56 (1908)

Le phénomène de Bose et l'électr. de contact.

[illegible] Torsion [illegible] El. [illegible] (colloidal) [illegible] $CuCO_3$ (kolloid. Salicin.) [illegible] El. [illegible]

[illegible] Torsion, Schw.

= El. [illegible]; [illegible] Torsion [illegible]

[illegible]

Z. [illegible] 17, p. [illegible]

[illegible]

Ströme wenn eine Elektrode ruht, die andere, symmetrische bestrahlt wird:

Helmholtz Ges. Abhdl. I 899 (94 in [illegible]) [illegible]

Billitzer Z ph Ch 48, 542 (1904)

Freundlich p 230 — Chanoz ? p. 215.

Pionchon

Leitfähigkeit colloider Lösungen: [illegible] & Schneider Z ph Ch 8, 278 (1891)

Picton & Linder J Ch S. 71, 568 (1897)

Billitzer Z ph Ch. 45, 307 (1903)

51, 129 (1905)

Whitney & Blake J Am Ch S. 26, 1339 (1904)

Duclaux, CR 140, 1468 (1905, Koll Ztschr 3, 126 (1908) J ch. ph. 5, 29 (1907)

Malfitano CR 143, 172 (1906)

Burton Ph M. 12, 472 (1906)

Lottermoser Z ph Ch. 60, 451 (1907), 62, 359 (1908)

vgl. Ostwald p. 243

Freundlich p. 338

Coh

$$\frac{K_x h_x}{K_s h_s} =$$

$$\frac{h_x}{K_x}\frac{\bar{K}_a}{h_a} = \frac{\Delta\varphi_x}{\Delta\varphi_a} = \alpha \quad \bar{K}_x = \frac{h_x}{h_a}\frac{K_a}{\alpha}$$

$$\bar{K}_x = \frac{h_x}{h_a} \cdot \frac{265}{}$$

$\frac{210}{60} \cdot \frac{265}{81}$

$\frac{83}{71} \quad \frac{26.5}{55}$

$\frac{85.5}{58} \quad \frac{26.5}{37.2}$

$\frac{102}{57} \cdot \frac{26.5}{36.7}$

$\frac{81.5}{61.3} \quad \frac{}{34}$

$\frac{13.2}{21} \cdot \frac{}{29}$

$$\Delta\varphi = \frac{P}{2EK}(R^2\pi)$$

$R = 1.18 \cdot 10^{-2}$

$E = 880\,V. = \frac{880}{300}$

$P = 0.363 \cdot g$

$K = 81$

$$\Delta\varphi_{H_2O} = \frac{3 \cdot 0.363 \cdot 981 \cdot (1.18)^2 10^{-4} \cdot \pi}{\cancel{2 \cdot 88} \cdot \cancel{81}\, 27}$$

17.6

5599 -1	1.2455
2.9917	1.4314
0.4971 -4	2.6769
0.1438	
0.1925 -1	$0.000328 \cdot 300$
2.6769	$= 0.0984$ Volt
0.5156 -4	

3222	9191	9320	0086	9112	1206	6902	0
7782	8513	7634	7559	7875	3222	7634	0
5440	0678	1686	2527	1237	7984	9268	0
~~5147~~	~~6750~~	~~8527~~	~~8621~~	~~8866~~	~~9608~~	~~9918~~	0

3010	7767	6812	4698	1139	5502	0969	1072
3222	7875	7799	7799	3222	7482	3324	3522
9788	9892	9013	6899	7917	8020	7645	7550
4150	4065	3502	2730	2695	2648	2480	2240
5638	5827	5511	4169	5222	5372	5165	5310

2788	6990	0414	9777	9395	2553	4472	9912
7782	3222	7559	7782	8261	8129	7559	8195
5006	3768	2855	1995	1134	4424	6913	1317
8889	9066	1547	0969	1367	2854	3125	6190

~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~
9085	7482	5705	5611	5366	4624	4314	4232
~~5147~~	~~6750~~	~~8527~~	~~8621~~	~~8866~~	9608	9918	0

~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~	~~4232~~
4150	4065	3502	2730	2695	2648	2480	2240

~~2581~~

1461	0934	0453	9031	~~8633~~	7743	6875	3802

$c_+ c_- = k$ $\qquad c_- = \frac{k}{c_+}$ $\qquad c_+ = c_0 + x$

$\lg \frac{c_+}{c_-} = \lg\left(\frac{c_+^2}{k}\right)$ $\qquad (c_0 + x)c$

$$\frac{h_x}{h} = \frac{D_x - D_{x}}{D - D_{x}}$$

$\cancel{\frac{75.6}{210}} \cdot \cancel{\frac{108}{30}} = 0.36$

$\frac{20}{21} \cdot \frac{75.60}{302} + 6.0$

7 307

$100 : 49 = 204$

20

$\frac{20}{21} \cdot \frac{150.70}{2107}$

5440	0678	1686	2527
9085	7402	5705	5611
6355	3190	5981	6916
4232	4232	4232	4232
0587	7428	0213	1148

	21.3		
1237	7984	9268	0
5366	4624	4314	4232
5871	3360	4954	5768
4232	4232	4232	4232
0103	7592	9186	5000

5638	5827	5511	4169	5222	5372	5165	5310
4232	4232	4232	4232	4232	4232	4232	4232
9870	0059	9743	8401	9454	9604	9397	9542
3545	2834	2402	2964	2501	7281	0038	7915
4232	4232	4232	4232	4232	4232	4232	4232
7777	7066	6634	7196	6733	1513	4270	2147

1.44	0.553	1.05	1.31	1.03	0.575	0.829	1.0
0.97	1.01	0.94	0.69	0.88	0.91	0.87	0.90
0.60	0.51	0.46	0.52	0.47	0.442	0.267	1.64

Al	27·1	54·2	54·2
S	32	32	288
O	16	64	342·2

$\frac{14}{150}$

$\frac{2.\ 6\cdot7.\ 10^{-5}}{150}$.

$26\cdot0.\ \frac{342\cdot2}{54\cdot2}.\ (2.10^{-2}).10^{-5}$

$0\cdot3\ .\ 52.\ 10^{-7}$

31·5
1·26

$\cancel{378.10^{-7}}$

$16\cdot4.\ 10^{-5}$

52 6·3

$\cancel{28}\ 16.10^{2}$

$\cancel{70}$

$52\cdot0.\ \frac{342}{288}.\ 10^{-5}$ per 100 cm³

$\frac{52}{288}.10^{-5} = 0\cdot180\ .10^{-5}$ per 100 cm³

232 : 29
30

$= 18.\ 10^{-6}$ per 1000 cm³

630

$770.\ 10^{-6}$.

342
86 = 2·25
68
18

4·5

1·10 10^{-6}

0·41

5340 2924
4666

630 : 340 = 1·85 10^{-6}
29
18

1·10

0·55

$\frac{27.2 \cdot 200}{96} = \frac{26 \cdot 200}{96}$

$\frac{770}{271} = 284$ per 1000 47.2

228

11

$\frac{140}{271} = 51$ $\frac{190}{271} = \cancel{5}\,6\,7$

1939

$190 : 274 = 0$

27

$\cancel{30 : 271 = 133}$

$\cancel{89}$

8

$63 : 271 = 232$

88

7

$$\frac{10^{+6} \cdot 10^{9}}{3 \cdot 10^{20}} = \frac{1}{3} \cdot 10^{-5}$$

$$\frac{10^{6}}{9 \cdot 10^{11}} \quad \frac{4}{9 \cdot 10^{4}} \quad \frac{1}{0.01} = a^2$$

$$\frac{4}{9 \cdot 9}\, 10^{-7} = \frac{1}{2} \cdot 10^{-8}$$

$$a = \frac{\varphi_1 - \varphi_0}{4\pi}$$

$$V = K\frac{\varphi_1 - \varphi_0}{4\pi\cancel{\mu}}\, 6\, \cancel{\mu} \cdot \frac{1}{2}\, c\cancel{\mu}\, a \frac{x}{r^3}$$

$$c\left[6\pi\mu a c + \frac{6\pi c 6}{a}\left(\frac{\varphi_1 - \varphi_0}{4\pi}\right)^2\right] =$$

$$\left(K\frac{\varphi_1 - \varphi_0}{4\pi}\right)^2 \frac{c6}{u}$$

$$= 6\pi\mu a c^2\left[1 + \frac{6}{\mu a^2}\left(\frac{\varphi_1 - \varphi_0}{4\pi}\right)^2\right]$$

$$\frac{x}{a^2}\left(1 + \frac{a^3}{2r^3}\right) = \frac{1}{a}\cos\theta + \frac{a}{2}\frac{\cos\theta}{r^2} \quad \Big\| \quad \frac{\partial}{\partial r} = -$$

$$6 = 10^{-6} \qquad \alpha = \frac{1}{300 \cdot 4 \cdot \pi}\sqrt{10^{-4}} = \; = \frac{1}{2}\, 10^{-5}$$

$$\mu = 10^{-2}$$

Cohn

Torri(?) diffusion ... Zeitschr. f. Elch. 15 p 160 (1909)

Helmholtz'sche Theorie zu ersetzen durch Gouy

Knobloch ?

Bollitier ? Nullpunkt ?

Nernst, Haber & Kl., Cameron & Ott

Freundlich

Gouy Dielektr.-const.

Elektronen ... Lewis

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Kl.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible] (1936) [illegible]

[illegible]

[illegible]

[illegible]

[illegible] 1936 [illegible]

[illegible]

[illegible] $C = 1.4$ [illegible]

[illegible]

[illegible]

[illegible]

$$N = \frac{K J 6 \varphi}{4\pi\eta} =$$

[illegible]

VII

VI. VII.

IV

II III $CuSO_4$

$\sim \frac{1}{10 \ldots}$

$ZnSO_4$

$p = 76$

$\frac{M U_3}{3} = \frac{p}{h} \sim \Delta V$

[illegible] Zeitschr. [illegible] (19[illegible])

[illegible]

[illegible] 10[illegible] [illegible]

[illegible] 2.10^{-4} cm [illegible]

[illegible]

[illegible]

[illegible]

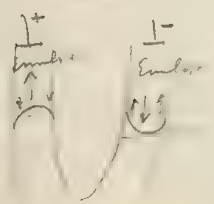
[illegible]

ca $\frac{1\ [illegible]}{10^{6}\ [illegible]}$ $\lambda - 18.10^{-6}$ [illegible]

II. [illegible] $\downarrow 4.3\ [illegible]^{-4}$ $\uparrow 2.56\ 10^{-4}$

[illegible]

[illegible]



[illegible]	2'5 cm	[illegible]	[illegible]	6.78
[illegible]	[illegible]	[illegible]	2.72	6.42

Lewis [illegible] $v = 4.3.10^{-4}$ ~~[illegible]~~ [illegible] 9[illegible]

[illegible]

[illegible]

2. 10^{-4} [illegible]
[illegible] .02

V

$-0{\cdot}95$

$-0{\cdot}00$

$0{\cdot}00$

$+\ 0{\cdot}[illegible]$

$+\ 0{\cdot}72$

$+\ 0{\cdot}3[illegible]$

$0{\cdot}5[illegible]$

[illegible]

$V' = v + a$

$V = $ [illegible]

$M - $ [illegible] $= \frac{|V'|}{n} = \overline{V}$

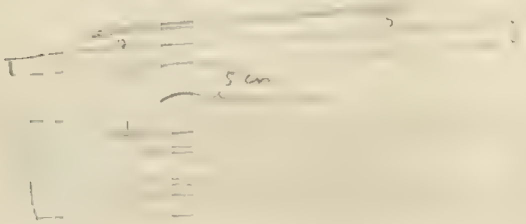
[illegible] $+\ 0{\cdot}35$ [illegible] $0{\cdot}006$

$\frac{1}{1{\cdot}10}$

$1^{0} = 7{\cdot}563$

$$V = V_{ps} + \frac{V_{pc} - V_{ps}}{1.365}$$

$$= \frac{0.365}{1.365} V_{ps} + \frac{V_{pc}}{1.365}$$



1) [illegible]

2) [illegible]

EK. [illegible]

$$\frac{\frac{\partial V}{\partial x}}{E} = 0.168$$

1

150

Człowiek starej daty k... zadziwiony ... tak

„nie zajmują się ... bo nie są zdolne"..

Dziś zapatrywania się zmieniły: ... potrzeba myśli

Absolwentki gimnazjów ... profesorowie : nie ustępują

W Anglii Ameryce ... stopnie nauk., naucza..

Cambridge 17 Kol. Girton, Newnham

Oxford [illegible] (Charlotte Scott) ... Wellesley Coll.

Nie ulega zatem żadnej wątpliwości, i każdy to przyzna mówi że spora liczba kobiet

które są zdolne ... uczenia się i uczenia

Ale twórczość naukowa całkiem odmienna ; z wyjątkiem tonu: quantité négligeable

---

Z [illegible] w moim przystępie naukowym

Fulhame 1794 , H Sidgwick 1880-1889 , Ayrton 1902 F.R.S.

Pockels, [illegible]

Ale tylko dla tego że były kobietami, przyczynek drobny, ginie po [illegible]

Auerbach [illegible] 1300

Madm. S. Germain jest znana w fizyce jako autorka [illegible] pracy o [illegible]

Mały przedmiot objaśnić: Chladni 1802

Napoleon 1809 Ak. Fr.

1811 błąd Lagrange, 1815

Wiemy że błędna ; równ. różn. dobre, warunki krańcowe błędne

[illegible] i Poisson 1829 ; Kirchhoff 1850 W. Ritz 1909 [illegible]

+30 lat.

Więc praca wybitna ; osobistość z

1776-1831 [illegible] z drugiej strony „Klasyk" 17 lat 5 prac

$K(\varphi_0 - \psi_0) = V.4n3$

$\eta = 0.00896$

0.9523 −3
0.6021
0.49715

0.0515 −1

1.8865

0.1650 −3
0.5855 −4
4.9542

0.7047 −2

0.0507

0.1650
4.9542
0.6812 −4

0.8004 −2

$\frac{27}{49} \cdot \frac{63}{} \; 7 \quad +2\frac{2}{7}$

243 : 7
= 347
7

$\frac{63}{48} \cdot 3$

189 : 8 = 236

$\frac{63}{49} \; 7 \quad +2\frac{2}{7}$

129
2

$\frac{650}{48} \cdot 70$

16

4

Vers. 1) [illegible]

2) [illegible] $2\frac{1}{2}$ [illegible]

[illegible]

[illegible] $E = \frac{[illegible]}{H \cdot K}$

[illegible] $e = \frac{[illegible]}{14}$

	V	E	Sc/1·0	
		0·[illegible]	0·004	$\theta = 25^0$
1) [illegible]	+ [illegible]	[illegible]	57	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	2·[illegible]	66	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	
Amt	[illegible]	11	[illegible]	
[illegible]	[illegible]	15	[illegible]	
[illegible]	[illegible]	2[illegible]	[illegible]	
[illegible]	[illegible]			

[illegible] $e = 2$ [illegible] 10^{10} [illegible] 10^{-10}

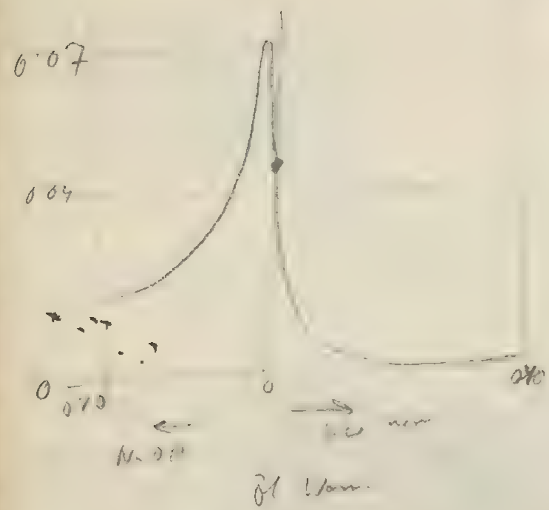
[illegible]

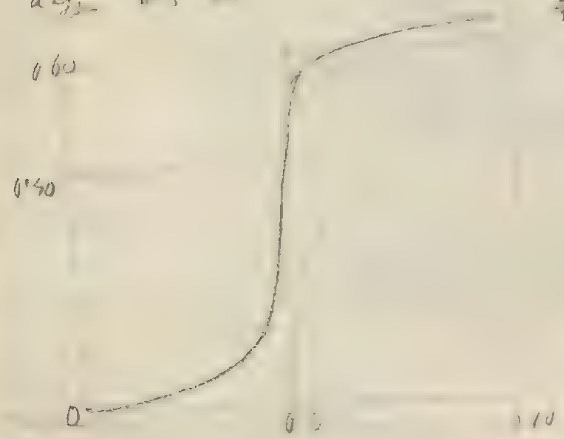
Unsinn!

[illegible]

[illegible]

1) [illegible]	Oc	E	Sc/1·0	
	0·0	0	0·0	K = [illegible]
$\frac{1}{10}$ normal HCl	+0·18	0·0022	0·0022	
$\frac{1}{40}$	·71	88	25	
$\frac{1}{100}$	1·4[illegible]	185	125	
$\frac{1}{200}$	[illegible]	50	[illegible]	
~~0~~ [illegible]	5·78			
$\frac{1}{1000}$ NaOH	5·[illegible]	92	4[illegible]	
$\frac{1}{500}$	[illegible]	68	[illegible]	
$\frac{1}{100}$		42	29	
1/[illegible]	1·[illegible]5	22	155	





... 0·6 V

Zusammenfassung:

1) KOH ... Maximum ...

2) ...

3) ... erhöht ...

4) ...

$V' = V + u$

$V'_{x=0} = V + \beta$

$V'_{x=d} = V + \beta\left[1 - \frac{3}{2}\right] = V + \frac{\beta}{2}$

$\frac{\sqrt{12}}{12} = \frac{\sqrt{3}}{6} = \frac{1.732}{6} = 0.289$

$\frac{1}{6} - \frac{1}{36} = \frac{5}{36} \cdot 6$

$6 \cdot \frac{3}{16} = \frac{9}{8}$

$V_{1/6} = V + \beta/_6$

$V'_{\frac{1}{2}} = V - \frac{\beta}{2}$

$\frac{3V_{1/6} + V_{\frac{1}{2}}}{4} = V$

$-\frac{1}{6} = -\frac{x}{d} + \left(\frac{x}{d}\right)^2$

$\left(\xi - \frac{1}{2}\right)^2 = \frac{1}{4} - \frac{1}{6} = \frac{1}{12}$

$\xi = \frac{1}{2} \pm \sqrt{\frac{1}{12}}$

$V_0' = 0.95$

$V'_{\frac{1}{2}} = 5.50$

$3V = V'_0 + 2V'_{\frac{1}{2}}$

$V = \frac{V'_0 + 2V'_{\frac{1}{2}}}{3}$

$= 0.333\,V'_0 + 0.667\,V'_{\frac{1}{2}}$

$V = 0.361\,V_0' + \ldots$

0.639

Empirisch: $V_{\frac{1}{2}} = V - \frac{\beta}{2}$

$V_{\frac{1}{4}} = V + \beta\left(1 - \frac{9}{8}\right) = V - \frac{\beta}{8}$

$4V_{\frac{1}{4}} - V_{\frac{1}{2}} = 3V$

$V = 3.33$ $\quad \beta = +4.28$

0.54

3.87

Im Falle kreisförmiger Röhre:

$\frac{\partial}{\partial r}\left(r\frac{\partial u}{\partial r}\right) = r\frac{\partial p}{\partial x}$

$\frac{\partial u}{\partial r} = \frac{r}{2}\frac{\Delta p}{\mu} + \frac{\alpha}{r}$

$u = \frac{r^2}{4}\frac{\Delta p}{\mu} + \beta$

$u = \frac{\Delta p}{4\mu}(a^2 - r^2) + \beta$

$\int 2\pi r u\, dr = \frac{2\pi\,\Delta p}{4\mu}\left(\frac{a^4}{2} - \frac{a^4}{4}\right) = \frac{\pi\,\Delta p\, a^4}{8\mu} + \pi a^2\beta = 0$

$\beta = -\frac{\Delta p}{8\mu}a^2$

$u = \beta\left[1 - \frac{2}{a^2}(a^2 - r^2)\right]$

$= \beta\left[\frac{2r^2}{a^2} - 1\right]$

also im Gleichgewichtszustand ist $\left.\begin{array}{l} u_0 = -\beta \\ u_a = +\beta \end{array}\right\}$ unabhängig von Röhrenweite

aber es wird immer länger brauchen je weiter Röhre ist bis ein solcher entsteht

$\rho \frac{\partial v}{\partial t} = \mu \frac{\partial^2 v}{\partial x^2}$ $\qquad v = \frac{2 v_0}{\sqrt{\pi}} \int_0^{\frac{x}{2a\sqrt{t}}} e^{-\beta^2} d\beta$

$\frac{\partial v}{\partial t} = \underbrace{\left(\frac{\mu}{\rho}\right)}_{a^2} \frac{\partial^2 v}{\partial x^2}$

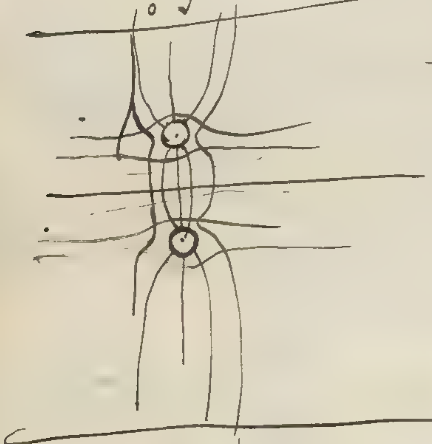
[illegible] $\qquad \sqrt{t} = \frac{x}{2a}$

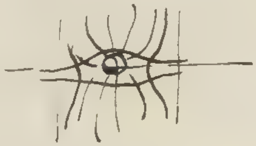
$t = \frac{x^2 \rho}{4\mu}$

$\mu = 0{\cdot}01 \qquad t = 1-2$ min

$\eta = \int_0^t v\,dt$

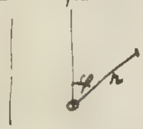
$= t\,v\Big|_0^t - \int t \frac{\partial v}{\partial t}\,dt$





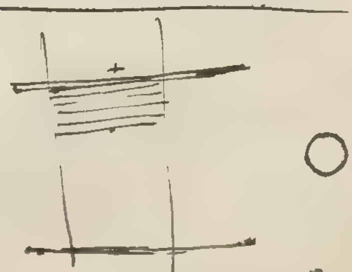
Beeinflussung der Kataphorese. [illegible]

$\sum \frac{\cos\varphi}{r^2}$



$\int \frac{x}{r^3}\,d\omega$

$= \sum \frac{\partial}{\partial x}\left(\frac{1}{r}\right) d\omega$



$\int \cos\varphi \sin\varphi \, d\varphi \, d\omega \, d\psi$

3

$V = K\left(\frac{\varphi_1 - \varphi_0}{4\pi}\right)/\mu \quad \Big\| \quad \frac{E}{6\pi\mu a} \qquad \frac{K\varphi_1}{6\pi\mu}$

$\frac{\cancel{1.3}}{3.4\pi} K(\varphi_1 - \varphi_0) \frac{g\rho}{\eta} R^3 6$

Zitate

? Munck Arch. f. Physiol. 1873 Heft 3, 4

~~? Gore Phil. Mag. 5, 455 (1880)~~

~~S. ? Frischen ... 32, 277~~

Quincke Strömungsstrom ... Elektr.?

?

Polarisation ?

§ 26

§ 36

Elster ... 553 (1875)

Wiedem. Ann. 87, 321 (1852)

Dorn Fresenius ... Zitat

Kaiser ... 53, 667, 1894

Elster 100 Volt

5 Volt 1910 ... ?

A. Roiti ... 4 ... § 90

Thomson ... Cohn ...

V. ...

28

Dom Wut in k 6

in fol. 3 p. 32

9,5 13, 10,45

We Lwowie, dnia 18.marca 1912

Zaproszenie

na posiedzenie Grona nauczycielskiego Wydziału filozoficznego, które się odbędzie we środę, dnia 20.marca 1912 o g. $3^{3}/4$ po płdn, w Auli.

Porządek dzienny:

Sprawa frekwentacyi za zimowe półrocze 1911/12.

Dziekan Wydziału filozoficznego

Wartenberg m.p.

Gierand weiter Zitch.

J.d.pl.

p. 45

[illegible]

[illegible]

Jour. R. S. E. 5 [illegible] 6 [illegible] 66 [illegible]

[illegible]

[illegible]

[illegible]

$Zn, Fe, [illegible], Zin$ [illegible]

[illegible]

[illegible] Z [illegible]

[illegible] ~~[illegible]~~ [illegible]

[illegible] II [illegible]

[illegible] Schlbom [illegible]

[illegible]

[illegible]

[illegible] Zeisman [illegible]

XII [illegible]

$$\varepsilon \frac{\partial V}{\partial x} = \mu \frac{\partial^2 u}{\partial y^2} = X\, K \frac{\partial^2 V}{\partial y^2}$$

$$\mu u = X\, K (V - V_0)$$

Term [illegible] Flüssigkeit [illegible]

Potential-Gradient [illegible] $b = \frac{[illegible]}{[illegible]}$

H_2O $\varphi = 2°52'$ [illegible]

P	v	$J \cdot 10^8$ Amp	b
17·06	19	[illegible]	0·0₄ [illegible]
[illegible]	[illegible]	2·2	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	58	748	[illegible]
			$0{\cdot}0_4\,535$

Mittel [illegible] $b = 0{\cdot}0_4\,2$[illegible]

[illegible] $0{\cdot}0_4\,165$ [illegible]

$\frac{1}{2}$ Länge

		$0{\cdot}0_4\,530$
17·06	21	[illegible]
[illegible]	31	525
[illegible]	[illegible]	5[illegible]
[illegible]	[illegible]	
		[illegible]

[illegible] $H_2O \| b = 0{\cdot}0_4\,55 - 67$

[illegible] 34

E_0^e [illegible] $H = 1$. H_2O $4722 \cdot 10^6$

A [illegible] $6365 \cdot 10^6$

A [illegible] $23350 \cdot 10^6$

[illegible]

CS₂ Δh

Vega 2.

Tiasoplatte

Pt

$\varphi = 5^0 5'$ $\theta = 15^0$

		$\Delta\rho$	0·002 %	0·004	0·016
$\rho = 40$	70		k = 3	k = 36	28·6
			29·25	15·4	
			−29·2	−15·3	−2·2
				8	1
20	35		12·6		
			−15·3	−8	−1·1
10			5		
			5·0		

$2r = 0·9$ mm $L = 200$ mm $\varphi = 5^0 4\,3'$ $\theta = 16·8^0$

3 Z. Fl.

	Δh	$-\Delta h$		
60	48·77		47·31	
40	34·52	32·5	31·54	
30	23·95		23·65	
20	14·29		15·77	
10			7·88	
5		3·50	3·94	6402
				35554

437

L mm	$2r$	φ	θ	T	Δh	$\sigma = \frac{1}{22·9}\frac{r^2}{L}\Delta h \cdot \varphi$
				81	20·15	0·0₄ 6060
1) 90	0·376	$9^0 6·5$	17·9		19·508	5947
2)		$8^0 52·8$	15	78	18·035	5540
3)		$8^0 49·7$	15	78		5578
4) 100	0·597	$5^0 25·5$	15·8	78	7·335	6011
5)		$5^0 14$	15·5	78	5·850	5501
6)		$5^0 26·5$	14	80		
7) 205	1·775	$8^0 49·7$	15	78	0·940	5400
8) 130	1·008	$8^0 55$	15	78	1·385	5901
	1·820	$20^0 8·5$		78		5074

in [illegible] $b = 0{\cdot}0_4\ 7933$

[illegible] 7950 – 7833

[illegible] η^{d} 0.8354 (15°) $b = 0{\cdot}0_4\ 7933$

7914

[illegible]

---

bei [illegible] | b $0{\cdot}0_4 55 - 0\,0_4 07$ [illegible]

[illegible] | 1220 [illegible]

[illegible]

Terp.öl [illegible]

$$em = \frac{\delta}{\ } \ [illegible]\ 110^{1}$$

CS_2 [illegible]

Hg [illegible] 0.02 mm [illegible] | [illegible]

Stärke [illegible] 0.4 mm [illegible] 100 [illegible]

Pt	S +
Au	Schellack
Cu	Seide
Fe	Baumwolle
Graph.	Stärke
Quarz	Lycopodium
Feldspat	Carmin
Manganit	Papier
[illegible]	Federkiel
Schmirgel	[illegible]
gelbes [illegible]	[illegible]
Corallen-roth	Terp.öl
O_2	CS_2
H_2	CO_2
	[illegible]
	[illegible]

258·2 383·5 412·0 425·1 395 255·6 −184·3

~~405~~ ~~491~~ ~~476~~ ~~498~~ ~~488~~ ~~363~~ ~~296~~

$\frac{1}{0·046 . 900}$

60 28
9542
1·6170
0·3830 − 2
= 0·02415

5164
1032
26
13
6·24

767
1534
38
20
9·26

824
1648
41
20
9·95

8502
17004
425
21
1027

790
158
6
9·54

5112
10224
255
128
6178

3686
7372
184
92
4451

$\left(\frac{383}{0748}\right)^4$

5832
1703
1·4129 . 4
5·6516

448.00

346
148

5391
1703
0·3688
1·4752

2987

302 . 2
60·4

226
112

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$$\left(\frac{dV_1}{dy}\right) = [illegible]$$

[illegible]

$$\left(\frac{dV_1}{dy}\right) = \frac{52-4a}{\sqrt{3}} [illegible]$$

[illegible]

[illegible]

[illegible] A [illegible]

[illegible]	[illegible]	$\bar{A}$ [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	80	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	70	0.78	[illegible]
[illegible]			[illegible]

A [illegible]

[illegible] Strom entgegen [illegible]

[illegible]

weit stärker [illegible]

[illegible]

10.9

[illegible]

[illegible] $H = 0.243$ [illegible] 86

[illegible] 35 Z 11 [illegible] 1555 [illegible] 35

1) [illegible] p. 308 [illegible]

2). p. 353 Z 2 v u

354 Z 2 v o [illegible]

3). 366 Z 1/3 v. o. W_{12} [illegible]

4/2 · 374 (1:3) [illegible]

g. t. Elektrometer [illegible]

[illegible] 5006 [illegible] 0.4508 mm

f	E	E_{500}				
326.4	0.851	2.608		322	1.002	3.113
953.5	2.423	2.531	2.5??	956	2.876	3.008
304.?	0.788	2.550		3?5	0.958	3.04?

[illegible] ; E [illegible]

[illegible]:

[illegible]				
[illegible]	0'5413	~~[illegible]~~		[illegible]
	0'4588	[illegible]	~~[illegible]~~ [illegible]	[illegible]
[illegible]	0'2617	[illegible]	[illegible]	[illegible]
		[illegible]	2'2.5	[illegible]

		E_{1000}	6.18			
41	884	2'113	[illegible]			
42	[illegible]	2'084	[illegible]	3'926		
42	995	2'240		[illegible]	4'001	D.
41	900	2'235	4'285	[illegible]		
41	999	2'210		[illegible]		3'93[illegible]
[illegible]	1000	3'695	4'20[illegible]	3'995		
[illegible]	1000	3'604	8'17[illegible]	3'9[illegible]	[illegible]	
				3'8[illegible]		

(40) 499'7 0'5413

(41) ✓ 500'6 0'4508

([illegible]) 700'[illegible] 0'2617

(43) 1038'15 0'2061

Dogg – (21		E_{1000}	6	
	1502	1'301	1'8[illegible]	
	1000	1'626	4'801	3'719
1 103'97	[illegible]	1'253		[illegible]3
[illegible] 0'93[illegible]				2'764
1 15'03 22	996	1'112		1'99[illegible]
[illegible] 0'2797				

[illegible]

[illegible] x) J – [illegible], [illegible] E [illegible]

[illegible] $J \sim \frac{1}{r}$

[illegible] $E \sim \frac{1}{r}$

[illegible]

102·38
102·3
112·6

98 [illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	150	5·50
[illegible]	555	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	180	[illegible]

[illegible] 488 mm

t	ϑ	L	T	[illegible]	$\frac{T}{100}$
−54"70 51·90	53"3[illegible]	460 mm	[illegible]	72	71·56
			[illegible]	77	[illegible]
	23 52	230			
			[illegible]	77	[illegible]
	20·57	460			
			[illegible]	77	[illegible]
	[illegible]	230			

[illegible]

257
24·5
24·3
25·0
24·4
239

24·78

7686
2314

534
53
587

0·017

$r = 0·348$ mm

$l = 402$

~~$p = \ldots$~~

$p_{100} = 257 \quad 245 \quad 243$

$p = 39·3 \quad 19·5 \quad [illegible]$

$L = 552$

$p = [illegible]$

$r = 53·4$ [illegible]

$r = [illegible]$

$l = [illegible]$

$p = 115 \quad [illegible]$

46·1 [illegible]

11 (45·3)

$r = [illegible]$

560 [illegible]

221

39·2

40·0

1182

(39·4)

$r = ·0\,335$

$l = 477$

$p = 89·3 \quad 40·8 \quad 71·0 \quad 42·0$

[illegible] 44·3 44·3 [illegible]

300

228 : 6

(43·8)

Sorrus [illegible]

Rohr [illegible]

Rohr (Wall d [illegible]

G. Sore ORS 31. 263 [illegible]

– [illegible]

16

$\frac{T_n}{L}$ $\frac{5332 \cdot 2300}{460} = 767$

$\frac{2291 \cdot 230}{324} = 582$ 873 7

6693 : 4

$\frac{T_n}{L}$ $\frac{5332 \cdot 16}{460}$ 230

16 : 230 = 0·06952
22
13
5

5332
2596
31992
4799
267
11
37069

4704 . 6952.
27808
4866
28
3270

$\frac{2051 \cdot 77}{460}$ 2051 : 46 = 4454
211
25
2

29178
2918
32096

371
327
321
275
1294 : 4 = 323·5

$\frac{821 \cdot 77}{160}$ 13 23

357 . 2499
250
2749

$\frac{22 \cdot 99 \cdot T\, n}{1 \cdot 9}$ 0·0437

$\frac{\cdot 0 \cdot 0437}{1 \cdot 9 \cdot 323 \cdot 5} = \frac{1 \cdot 9 \cdot 0 \cdot 0437}{647}$

$= \frac{1 \cdot 9 \cdot 432}{648} - \frac{1}{70}$

$= 3 \cdot 8 : 3 = 1 \cdot 27$

$1 \cdot 25 \cdot 10^{-4}$ mm

$\frac{1 \cdot 9 \cdot 7}{7\,cm}$ .... $\frac{0 \cdot 0437 \cdot 7}{23 \cdot 5 \cdot 1 \cdot 9}$

$\frac{0 \cdot 437}{1 \cdot 9 \cdot 32}$ −2%

$\frac{432}{648 \cdot 19} - \frac{1}{70}$

0·666 : 19 = 0·3505
96
10

$0 \cdot 345 \cdot 10^{-3}$

$\frac{28}{32 \cdot 1 \cdot 9}{46} = \frac{60}{46}$ Volt

$\frac{0 \cdot 00437}{53 \cdot 3} = 0 \cdot 00008$

$\frac{23}{8 \cdot 2 \cdot 77} = \frac{23}{640} = \frac{1}{32 \cdot 35}$

2788
8109
8897
5508

356

$\frac{77 \cdot 1 \cdot 9}{23} = 6 \cdot 4\ \frac{Volt}{cm}$ $\frac{0 \cdot 00437}{8 \cdot 2} = 0 \cdot 0005$

$\frac{0 \cdot 0437}{19 \cdot \quad 64 \cdot 7}$

$= 1.10 \cdot 5.9$

$k = \frac{1}{1836 \cdot 0.640} =$

$k = \eta \cdot 452 = m\, 0.116$

108
14
48
170

$\frac{0.25 \cdot 108}{116} \cdot 10^{-4} = 76 \cdot 10^{-3}$

$\frac{11}{80}$

87.10^{-4}

$= 0.25$

$52.9 \cdot 10^{4}$

50.

5	10	15	20	25	30
1.0503		1.1675	1.2322		
54	107	158	232	285	379
		152	206		318

Wiedem. 99 p. 88–100

$$n = n_0 \, e^{-\frac{1}{k} mgh\left(1 - \frac{1}{\rho}\right)} \qquad H = \frac{k}{mg\left(1 - \frac{1}{\rho}\right)} = 45.10^{15}$$

Trans. ... 83 – 94

J C ... 26. 11. 78

$CaCl_2$

$~~COH~~$ CCl_3OH

[illegible]

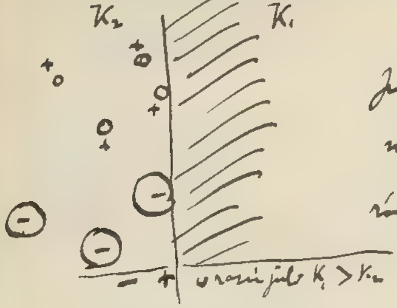
en [illegible]

[illegible]

[illegible]

[illegible]

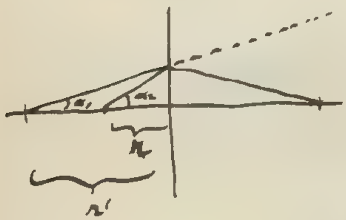
W nadzwyczajnie rozcieńczonym roztworze:



Jeśli lim ... $= \infty$

nie działają na siebie wzajemnie, tylko każdy według stanu równowagi pod wpływem działania ... i przyciąg. ...

Kryy. $H = 5.5$ $O_{(OH)} = 7.8$
$Cl = 22.8$ $HO = 13.3$
$Br = 27.8$ (Ztschr. Otto (1898)
$J = 37.5$ I 3 352–464



$$\frac{\operatorname{tg}\alpha_2}{\operatorname{tg}\alpha_1} = \frac{K_2}{K_1} = \frac{r'}{r}$$

$S_1 = S_2$

$$\frac{E^2}{8\pi}\int K\,\mathfrak{E}^2\,dv = \frac{E^2}{8\pi}\int_{\varphi=0}^{\frac{\pi}{2}}\int_{r=a}^{\frac{x}{\cos\varphi}} 2\pi\, r^2 \sin\varphi\, d\varphi\, dr\,\frac{K}{r^4}$$

$$= -\frac{K_2}{4}\int_0^{\frac{\pi}{2}}\left(\frac{\cos\varphi}{x}-\frac{1}{a}\right)\sin\varphi\, d\varphi$$

$$\frac{4\pi r^2 dr}{8\pi}\,\frac{E^2}{r^4}$$

$\frac{1}{2}$

$$= -\frac{K_2 E^2}{4}\left(\frac{1}{2x}-\frac{1}{a}\right)$$

$$\frac{1}{x'} = \frac{1}{x}\,\frac{K_1}{K_2}$$

$$W = \frac{E^2}{4}\left[\left(\frac{2}{a}-\frac{1}{2x}\right)K_2 + \left(\frac{K_1}{K_1}\right)\frac{K_1}{2x'}\right] = \frac{E^2}{4K_2}\left[\frac{2}{a}-\frac{1}{2x}+\right.$$

$$F_x = -\frac{\partial W}{\partial x} = \frac{E^2}{8}\left(\frac{\frac{1}{K_1}}{x^2} - \frac{\frac{1}{K_1}}{x'^2}\right) \qquad x' = x\frac{K_2}{K_1} \qquad \ldots = \left(\frac{K_1}{K_2}\right)^2$$

$$= \frac{E^2}{8x^2 K_2}\left[1-\left(\frac{K_1}{K_2}\right)^2\right]$$

$$\frac{\partial W}{\partial \alpha} = \ldots\; \frac{K_1}{\operatorname{tg}\alpha_1} + \frac{K_2}{\operatorname{tg}\alpha_2} = 0$$

$$\cancel{W = \frac{E^2}{2}\left[K_2\left(\frac{2}{a} - \frac{1}{2x}\right) + \frac{1}{2x}\frac{K_1}{K_2}\right]}$$

$$U_1 = \alpha\frac{E}{r} + \frac{e'}{r'} \quad\Big\|\quad U_2 = \frac{E}{r} + \frac{e''}{r''} \quad\Big\|\quad K_2\left\{\frac{\alpha E\cos\alpha_2}{r^2} + \frac{e'\cos\alpha_1}{r'^2}\right\} = K_1\left\{\frac{E\cos\alpha_2}{r^2} + \frac{e''\cos\alpha_1}{r'^2}\right\}$$

$$\alpha\frac{E}{r^3} + \frac{e'}{r'^3} = \frac{E}{r^3} + \frac{e''}{r''^3} \qquad \frac{\alpha E x}{r^3} + \frac{e'x'}{r'^3} = \frac{K_1}{K_2}\left\{+\frac{Ex}{r^3} - \frac{e''x'}{r''^3}\right\}$$

$$\frac{E(\alpha-1)}{r^3} = \frac{e''-e'}{r'^3} \qquad \frac{\alpha E}{r^3}\frac{K_1}{K_2} + \frac{e'}{r'^3} = \frac{K_1}{K_2}\left\{\frac{E}{r^3}\frac{K_1}{K_2} - \frac{e''}{r'^3}\right\}$$

$$\frac{E}{r^3}\frac{K_1}{K_2}\left(\alpha - \frac{K_1}{K_2}\right) = -\frac{\frac{K_1}{K_2}e'' + e'}{r'^3}$$

Dla każdego rodzaju jonów prawo aerostatyki

Dotąd tylko prace elektryczne uwzględnione, bez pracy osmotycznej ?

$$n_\alpha = n_{0\alpha}\, e^{-k\Phi_\alpha} \qquad k = \frac{4\theta}{N}$$

$$\Phi_\alpha = \varepsilon\nu_\alpha U + \Phi_{s\alpha}$$

ν = wartościowość i znak naboju

Φ_s = Potencjał sił nie pochodzących od elektryczności do samej ściany

$$\rho = \varepsilon\sum_\alpha n_\alpha \nu_\alpha\Big|_x = \frac{-K}{4\pi}\frac{\partial U}{\partial x^2}$$

$$U = 2\pi\int \rho_x\,dx\left(\sqrt{a^2+x^2} - x\right) = \lim_{a=\infty} 2\pi\int_{\xi=\xi_0}^{\infty}\rho_\xi\,d\xi\,\underbrace{\left[\sqrt{a^2+(x-\xi)^2} - (x-\xi)\right]}_{\left[a + \frac{(x-\xi)^2}{2a} - (x-\xi)\right]}$$

skończony jest $\underbrace{\int_{\xi_0}^{\infty}\rho_\xi\,d\xi = 0}$

zatem $\frac{\partial U}{\partial x}\Big|_{\xi_0}^{\infty} = 0$

więc $\frac{\partial U}{\partial \xi}\Big|_{\xi_0} = 0$

$$U = -\frac{K}{2}\int\frac{\partial^2 U}{\partial\xi^2}(x-\xi)\,d\xi$$

$$= -\frac{K}{2}\,x\,\frac{\partial U}{\partial\xi}\Big| + \frac{K}{2}\left(\xi\frac{\partial U}{\partial\xi} - U\right)\Big|$$

$$\rho = \varepsilon \sum_\alpha \nu_\alpha n_\alpha = -\frac{K}{4\pi\varepsilon} \frac{\partial^2}{\partial x^2}\left[\frac{\Phi_1 - \Phi_{1s}}{\nu_1}\right] = -\frac{K}{4\pi\varepsilon} \frac{\partial^2}{\partial x^2}\left[\frac{\Phi_2 - \Phi_{2s}}{\nu_2}\right] = \dots$$

$$\Phi_\alpha = \frac{1}{k} \lg\left(\frac{n_{0\alpha}}{n_\alpha}\right)$$

$$\frac{\partial^2 \Phi_\alpha}{\partial x^2} = \frac{1}{k} \frac{\partial}{\partial x}\left(\frac{1}{n_\alpha} \frac{\partial n_\alpha}{\partial x}\right)$$

$$k\frac{4\pi\varepsilon^2}{K} \sum \nu_\alpha n_\alpha = \frac{1}{\nu_1} \frac{\partial}{\partial x}\left(\frac{1}{n_1} \frac{\partial n_1}{\partial x}\right) = \frac{1}{\nu_2} \frac{\partial}{\partial x}\left(\frac{1}{n_2} \frac{\partial n_2}{\partial x}\right) = \dots$$

$$- \frac{\partial^2 \Phi_{1s}}{\partial x^2} \qquad - -$$

Nejprostší případ

$\nu_1 = +1 \qquad K_1 = K_2$

$\nu_2 = -1$

$$n_1 = n_{10}\, e^{-k\Phi_1} \qquad x > 0$$

$$n_2 = n_{20}\, e^{-k\Phi_2} \qquad x > a \qquad n_2 = 0,\ 0 < x < a$$

$$\Phi_1 = \varepsilon U \qquad \Phi_2 = -\varepsilon U$$

$$\rho = \varepsilon(n_1 - n_2) \qquad x > a \qquad \varepsilon(n_1 - n_2) \cdot 4\pi = -K \frac{\partial^2 U}{\partial x^2}$$

$$\rho = \varepsilon n_1 \qquad a > x > 0 \qquad \varepsilon n_1 \cdot 4\pi = -K \frac{\partial^2 U}{\partial x^2}$$

$$U_{x>a} = \frac{1}{\varepsilon k} \lg \frac{n_{10}}{n_1} = -\frac{1}{\varepsilon k} \lg \frac{n_{20}}{n_2}$$

$$U_{a>x>0} = \frac{1}{\varepsilon k} \lg \frac{n_{10}}{n_1}$$

$$\frac{4\pi\varepsilon}{K}(n_1 - n_2) = + \frac{1}{\varepsilon k}\frac{\partial^2}{\partial x^2}(\lg n_1) = -\frac{1}{\varepsilon k}\frac{\partial^2}{\partial x^2}\lg(n_2) \qquad \| \qquad x > a$$

$$\frac{4\pi\varepsilon}{K} n_1 = \frac{1}{\varepsilon k}\frac{\partial^2}{\partial x^2}(\lg n_1) \qquad a > x > 0$$

$$\cancel{\lg n_1 = -\lg n_2 + \alpha x + \beta}$$

$$\frac{4\pi\varepsilon^2 k}{K} n_1 = \frac{\partial^2}{\partial x^2}(\lg n_1) = \frac{\partial}{\partial x}\left(\frac{1}{n_1}\frac{\partial n_1}{\partial x}\right) = -\frac{1}{n_1^2}\left(\frac{\partial n_1}{\partial x}\right)^2 + \frac{1}{n_1}\frac{\partial^2 n_1}{\partial x^2}$$

$$\lg n_1 = y$$

$$\frac{\partial^2 y}{\partial x^2} = \frac{4\pi\varepsilon^2 k}{K} e^y \qquad e^y = n_1$$

$$e^y\, dy = dn_1$$

$$\frac{dy}{\cancel{dx}}\frac{d^2 y}{dx^2} = \alpha e^y\, dy$$

$$\frac{1}{2}\left(\frac{dy}{dx}\right)^2 = \alpha e^y + \beta$$

$$\int \frac{dy}{\sqrt{\beta + \alpha e^y}} = \int dx\sqrt{2} = x\sqrt{2} = \int \frac{dn_1}{n_1\sqrt{\beta + \alpha n_1}}$$

$$= \frac{1}{\sqrt{\beta}}\lg\left(\frac{\sqrt{\beta + \alpha e^y} - \sqrt{\beta}}{\sqrt{} + \sqrt{}}\right) = \frac{1}{\sqrt{\beta}}\lg\left(\frac{\sqrt{\beta + \alpha n_1} - \sqrt{\beta}}{\sqrt{\beta + \alpha n_1} + \sqrt{\beta}}\right) = x\sqrt{2} + \text{const}$$

$$= \frac{2}{\sqrt{\beta}}\lg\left[\frac{\sqrt{\beta + \alpha n_1} - \sqrt{\beta}}{\alpha n_1}\right] \qquad \frac{\sqrt{\beta + \alpha n_1} - \sqrt{\beta}}{\sqrt{} + \sqrt{}} = e^{x\sqrt{2\beta} + x_0} = \gamma$$

$$\cancel{\sqrt{\beta + \alpha x} - \sqrt{\beta} = \gamma(\sqrt{} + \sqrt{\beta}) + \sqrt{\beta}}$$

$$\cancel{\beta + \alpha x = \gamma^2(2\beta + \alpha x + 2\sqrt{\beta^2 + \beta\alpha x}) + 2\gamma(\sqrt{\beta^2 + \beta\alpha x} + \beta) + \beta}$$

$$\cancel{[\alpha x(\gamma^2 - 1) + 2\beta\gamma^2 + 2\beta\gamma] = [2\gamma^2 + \gamma]^2 (\beta^2 + \beta\alpha x)}$$

$$\gamma = \frac{\sqrt{1 + \frac{\alpha x}{\beta}} - 1}{\sqrt{} + 1} = \frac{\left[\sqrt{1 + \frac{\alpha x}{\beta}} - 1\right]^2}{\frac{\alpha x}{\beta}}$$

$$\frac{\gamma\alpha x}{\beta} = 2 + \frac{\alpha x}{\beta} - 2\sqrt{1 + \frac{\alpha x}{\beta}}$$

$$1 + \frac{\alpha n}{2\beta}(1+y) = \sqrt{1+\frac{\alpha n}{\beta}}$$

$$\sqrt{1-\frac{4y}{(1+y)^2}} - 1 =$$

$$\frac{\alpha n}{\beta}(1+y) + \frac{\alpha^2 n^2}{4\beta^2}(1+y)^2 = \frac{\alpha n}{\beta}$$

$$= \frac{1-y-(1+y)}{1+y} = \frac{-2y}{2}$$

$$\frac{\alpha n}{\beta} = -\frac{4y}{(1+y)^2}$$

$$\frac{\alpha n}{\beta} = \frac{-4c\, e^{x\sqrt{2\beta}}}{\left[1+4c\, e^{x\sqrt{2\beta}}\right]^2} = \frac{n}{\beta}\, \frac{4\alpha\varepsilon^2 k}{K}$$

$a > x > 0$: (β innne nie rozpisuje)

$$\lg n_1 = -\lg n_2 + \beta$$

oznaczenie $\sqrt{2\beta} = b$

$$n \cdot \frac{8\pi\varepsilon^2 k}{b^2} = -\frac{4c\, e^{bx}}{\left[1+4c\, e^{bx}\right]^2}$$

$$n_2 = \frac{1}{n_1}\, e^{\beta}$$

$y = 0$ bo dla lim $x = \infty$ $n_1 n_2 = \text{const} = c^2$

$$\alpha\left[n_1 - \frac{1}{n_1} e^{\beta}\right] = \frac{\partial^2}{\partial x^2}\underbrace{(\lg n_1)}_{y}$$

$$\alpha\left(n_1 - \frac{c^2}{n_1}\right) = \frac{\partial}{\partial x^2}\lg n_1$$

$$\alpha\left[e^{y} - e^{-y+\beta}\right] = \frac{d^2y}{dx^2}$$

$$= \alpha\left[e^{y} - b\, e^{-y}\right]$$

dla $x = \infty$

$\frac{dy}{dx} = 0$

$$\frac{1}{2}\left(\frac{dy}{dx}\right)^2 = \alpha\left[e^{y} + c^2 e^{-y}\right] + m\alpha$$

$$\frac{c^2}{n_1} = n_1 + n_2 = m$$

$= -2c$

$$\frac{dy}{\sqrt{m + e^{y} + b^2 e^{-y}}} = dx\sqrt{2\alpha}$$

$e^y = z \qquad y = \lg z$

$dy = \frac{dz}{z} =$

$\sqrt{z} = t = \sqrt{e^y} = \sqrt{n_1}$

$b = \lim_{x=\infty}(n_1 n_2)$

$$\int \frac{dz}{z\sqrt{m + z + \frac{b}{z}}} = \int \frac{\frac{dz}{\sqrt{z}}}{\sqrt{mz + z^2 + b}} = 2\int \frac{dt}{\sqrt{mt^2 + t^4 + b}}$$

$$= 2 \lg\left[m + 2t + 2\sqrt{b + mt + t^2}\right] = x\sqrt{2\alpha} + \text{cont}$$

$$m + 2t + 2\sqrt{b + mt + t^2} = c\, e^{x\sqrt{\frac{\alpha}{2}}}$$

$$4(b + \cancel{mt} + \cancel{t^2}) = c^2 e^{x\sqrt{2\alpha}} - 2c\, e^{x\sqrt{\frac{\alpha}{2}}}(m + 2t) \cancel{+ m^2 + 4mt + 4t^2}$$

$$\frac{c^2 e^{x\sqrt{2\alpha}} - 4b + m^2 - 2cm\, e^{x\sqrt{\frac{\alpha}{2}}}}{4c\, e^{x\sqrt{\frac{\alpha}{2}}}} = t = \sqrt{n_1}$$

v roni $b = 0$

$$\frac{c^2}{4} e^{x\sqrt{\frac{\alpha}{2}}} - \frac{mc}{2} + \frac{m^2}{4} e^{-x\sqrt{\frac{\alpha}{2}}} = c\sqrt{n_1}$$

$$\left[\frac{c}{2} e^{\frac{x}{2}\sqrt{\frac{\alpha}{2}}} + \frac{m}{2} e^{-\frac{x}{2}\sqrt{\frac{\alpha}{2}}}\right]^2 =$$

$$= \int \frac{dz}{\sqrt{z}\sqrt{b^2 + mz + z^2}} = \int dz \left\{ \frac{\sqrt{b + mz + z^2}}{\sqrt{z}} - \frac{\sqrt{z}\,(m+2)}{\sqrt{b^2 + mz + z^2}} \right\}$$

$$= 2\int \frac{dt}{\sqrt{b^2 + mt^2 + t^4}} = f(t) = f(\sqrt{n_1}) = x\sqrt{2\alpha} + \text{cont}$$

$$= \int \frac{dn_1}{\sqrt{c^2 n_1 + m n_1^2 + n_1^3}}$$

$$= 2\int \frac{dt}{\sqrt{c^2 + 2ct^2 + t^4}} = 2\int \frac{dt}{c + t^2} = \frac{2}{\sqrt{c}} \operatorname{arctg} \frac{t}{\sqrt{c}}$$

$x > a$ | $a > x > 0$

$$\frac{\partial^2 U}{\partial x^2} = -\frac{4\pi\varepsilon}{K}(n_1 - n_2) \qquad \Bigg| = -\frac{4\pi\varepsilon}{K} n_1$$

$$\Delta\varphi = \cancel{\ldots} = \frac{4\pi\varepsilon}{K}\left[\int_{\xi=0}^{\infty} d\xi \int_0^{\xi} n_1\, dx - \int_a^{\infty} d\xi \int_a^{\xi} n_2\, dx\right]$$

$$\int_0^{\infty} \rho\, dx = 0 \text{ jeśli}$$

mi nie wszystko itd.

$$n_2 = \frac{k^2}{n_1}$$

$$\int_0^{\xi} n_1\, dx = n_{1\xi}\,\xi - \int_0^{\xi} x \frac{\partial n_1}{\partial x}\, dx$$

$$x\sqrt{2\alpha} + \text{const} = \frac{1}{\sqrt{c}} \lg\left(\frac{\sqrt{c}+t}{\sqrt{c}-t}\right) = \frac{1}{\sqrt{c}} \lg \frac{\sqrt{c}+\sqrt{n_1}}{\sqrt{c}-\sqrt{n_1}} = \frac{1}{\sqrt{c}} \lg \frac{1+\sqrt{\frac{n_1}{c_1}}}{1-\sqrt{\frac{n_1}{c_1}}}$$

$$\gamma e^{x\sqrt{2\alpha c}} = \frac{1+\sqrt{\frac{n_1}{c}}}{1-\sqrt{\frac{n_1}{c}}} \qquad \sqrt{\frac{n_1}{c}} = \frac{\gamma e^{x\sqrt{2\alpha c}} - 1}{\gamma e^{x\sqrt{2\alpha c}} + 1}$$

$$n_1 = c\left[\frac{\gamma e^{x\sqrt{2\alpha c}} - 1}{\gamma e^{x\sqrt{2\alpha c}} + 1}\right]^2 \quad \text{stwierdz.} \; D\ddot{r}.$$

dla $x = \infty$ $\quad n_1 = c$ $\quad$ $\gamma e^{xV} = 1$

posiada minimum $n_1 = 0$ dla γe … i stąd stała wzrasta

tyle w rozpr. musi się napisać dla większych x

rozwiązanie dla: $x < a$:

$$n_1 = \frac{4\gamma' e^{x\sqrt{2\alpha\beta}}}{\left[-\gamma' e^{x\sqrt{2\alpha\beta}} + 1\right]^2}\,\beta \quad \text{stwierdz.} \; D\ddot{r}.$$

$$\int_0^a n_1\, dx = \frac{4}{\left[1 - \gamma' e^{x\sqrt{2\alpha\beta}}\right]}\Bigg|_0^a \cdot \sqrt{\frac{\beta}{2\alpha}}$$

warunki do oznacz. stałych $\gamma' \beta \gamma$

dla $x = a$ $\quad n_1\Big|_{x>a} = n_1\Big|_{x<a}$

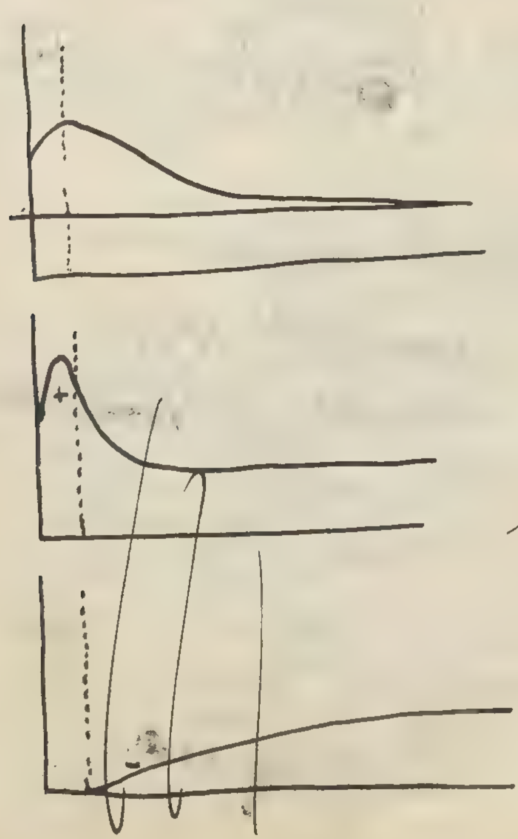
$$\frac{\partial U}{\partial x}\Big|_{x=0} = 0 \quad \boxed{\text{identyczny } 2\int_0^{\infty} \rho\, dx = 0}$$

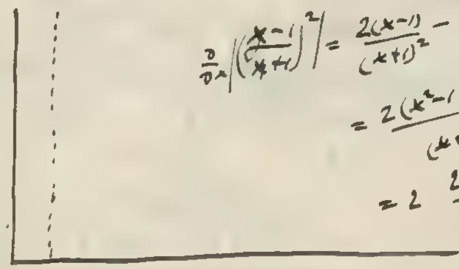
$$\frac{\partial U}{\partial x}\Big|_{x=+a} = \frac{\partial U}{\partial x}\Big|_{x=-a}$$

$$\int_a^\infty n_2\,dx = \int_a^\infty n_1\,dx + \int_0^a n_1\,dx$$

$$\int_a^\infty (n_2-n_1)\,dx = \int_0^a n_1\,dx = c\int_a^\infty \left\{\left[\frac{ye^{x\sqrt{2ac}}+1}{ye^{x\sqrt{}}-1}\right]^2 - \left[\frac{ye^{x\sqrt{}}-1}{ye^{x\sqrt{}}+1}\right]^2\right\}dx$$

$$= 2c\int \frac{4y^3e^{3x\sqrt{2ac}}+4ye^{x\sqrt{2ac}}}{\left[y^2e^{2x\sqrt{2ac}}-1\right]^2} = 8yc\int_a^\infty \frac{y^2e^{2x\sqrt{2ac}}+1}{\left[y^2e^{2x\sqrt{2ac}}-1\right]^2}\, e^{x\sqrt{2ac}}\,dx$$



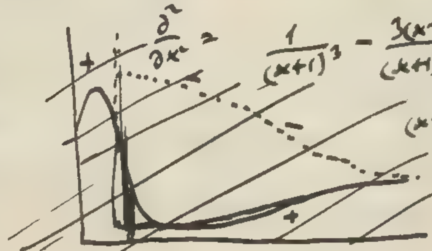


$$\frac{\partial}{\partial x}\left[\left(\frac{x-1}{x+1}\right)^2\right] = \frac{2(x-1)}{(x+1)^2} - \frac{2(x-1)^2}{(x+1)^3}$$

$$= \frac{2\left(x^2-1-(x-1)^2\right)}{(x+1)^3}$$

$$= 2\,\frac{2x-2}{(x+1)^3}$$

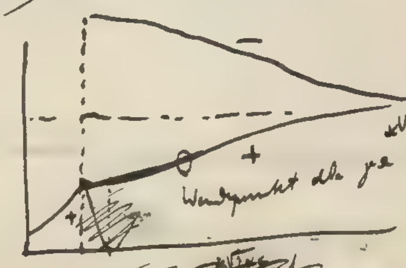
$$= 4\,\frac{x-1}{(x+1)^3}$$



$$\frac{\partial^2}{\partial x^2} = \frac{1}{(x+1)^3} - \frac{3(x-1)}{(x+1)^4} = 0$$

$$(x+1)-3x+3=0$$

$$x=2$$



Wendepunkt da $ye^{x\sqrt{2ac}} = 2$

$$\left.\frac{\partial U}{\partial x}\right|_{a} = \left(\frac{\partial U}{\partial x}\right)_0 + \int_0^x \frac{\partial^2 U}{\partial x^2}\,dx$$

$$= \left(\frac{\partial U}{\partial x}\right)_0 + \frac{4\pi\varepsilon}{K}\int_a^x (n_2 - n_1)\,dx - \frac{4\pi\varepsilon}{K}\int_0^a n_1\,dx$$

Więc warunek $\left.\frac{\partial U}{\partial x}\right|_{+a} = \left(\frac{\partial U}{\partial x}\right)_{-a}$ sam się spełnia

także $\left(\frac{\partial U}{\partial x}\right)_\infty = 0$ jeśli $\int \rho\, dx = 0$ i $\left(\frac{\partial U}{\partial x}\right)_0 = 0$

$0 > x > a$	$a > x$ $\quad \gamma > 1$
$n_1 = \dfrac{4\beta\, e^{x\sqrt{2\alpha\beta}+\gamma_1}}{\left[1 - e^{x\sqrt{2\alpha\beta}+\gamma_1}\right]^2} = \dfrac{4\beta\gamma' e^{x\sqrt{2\alpha\beta}}}{\left[1-\gamma' e^{x\sqrt{2\alpha\beta}}\right]^2}$	$n_1 = c\left[\dfrac{e^{x\sqrt{2\alpha c}+\gamma_2} - 1}{e^{x\sqrt{2\alpha c}+\gamma_2} + 1}\right]^2 = c\left[\dfrac{\gamma e^{x\sqrt{2\alpha c}} - 1}{\gamma e^{x\sqrt{2\alpha c}} + 1}\right]^2$
$n_2 = 0$ $\quad \gamma' e^{a\sqrt{2\alpha\beta}} < 1$	$n_2 = \dfrac{c^2}{n_1}$

$$\alpha = \frac{4\pi\varepsilon^2 k}{K}$$

I Warunek $\quad \Big|_{x=a} \quad n_1\Big|_{>} = n_1\Big|_{<}$

II $\quad \displaystyle\int_a^\infty (n_2 - n_1)\,dx = \int_0^a n_1\,dx$

~~pozornie 3 stałe $\beta, \gamma_1, \gamma_2$ ale ponieważ γ_1, γ_2 występuje w formie $x\sqrt{2\alpha\beta} + \gamma$ i tak samo też w warunkach granicznych~~

III ciśnienie zewnętrzne niezmienione, to samo co warunek (I), więc

$$n_2\Big|_a + n_1\Big|_0 = 2\sqrt{c} \qquad\qquad \frac{c^2}{n_1}\Big|_a + n_1\Big|_0 = 2 c$$

$$\int_a^\infty (n_2-n_1)\,dx = 8\gamma c \int_a^\infty \frac{\gamma^2 e^{2x\sqrt{2\alpha c}}+1}{\left[\gamma^2 e^{2x\sqrt{2\alpha c}}-1\right]^2}\, e^{x\sqrt{2\alpha c}}\,dx$$

$\gamma e^{x\sqrt{2\alpha c}} = y$

$\gamma\sqrt{2\alpha c}\; e^{x\sqrt{2\alpha c}} = dy$

$$\cancel{= 8\gamma c \int_b^\infty \frac{\gamma^2 y^2+1}{\left[\gamma^2 y^2-1\right]^2}\,dy} \qquad = \frac{8c}{\sqrt{2\alpha c}} \int^\infty \frac{y^2+1}{\left[y^2-1\right]^2}\,dy$$

$$\int \frac{y^2+1}{(y^2-1)^2}\,dy = \int \frac{1}{y^2-1}\,dy + \frac{2}{(y^2-1)^2}\,dy \qquad \Big\| \quad \int \frac{dy}{(y^2-1)^2} = \frac{-y}{2(y^2-1)} - \frac{1}{2}\int\frac{dy}{y^2-1}$$

$$\cancel{-\frac{1}{2(y^2-1)} + \frac{y^2}{(y^2-1)^2} - \frac{1}{2}\frac{y}{y^2-1}}$$

$$\cancel{\frac{y}{(y^2-1)^2} - \frac{1}{y^2-1}}$$

$$= -\frac{y}{2(y^2-1)} + \frac{1}{4}\lg\left(\frac{y+1}{y-1}\right)$$

$$\int_a^\infty (n_2-n_1)\,dx = \frac{8c}{\sqrt{2\alpha c}}\left\{\frac{-\gamma e^{x\sqrt{2\alpha c}}}{2\left(\gamma^2 e^{2x\sqrt{2\alpha c}}-1\right)} + \frac{1}{4}\lg\left[\frac{\gamma e^{x\sqrt{2\alpha c}}+1}{\gamma e^{x\sqrt{2\alpha c}}-1}\right]\right\}\Bigg|_{x=a}^{\infty}$$

$$\cancel{\frac{2y}{y^2-1} = \frac{1}{y-1} + \frac{1}{y+1}}$$

$$\frac{2y}{y^2-1} = \frac{1}{y-1} + \frac{1}{y+1}$$

$$= 4\sqrt{\frac{\beta}{2\alpha}}\left\{\frac{1}{\left[1-\gamma' e^{x\sqrt{2\alpha\beta}}\right]}\Bigg|_{x=a} - \frac{1}{1-\gamma'}\right\}$$

~~[illegible] tal zu~~

~~stetig vermuten~~

$$\cancel{\int_0^\infty (n_2-n_1)\,dx = \int_0^a n_1\,d\xi}$$

$$\frac{c_1^2}{n_{1a}^2} - 2\frac{c_1}{n_{1a}} + \frac{n_{10}}{n_{1a}} = 0$$

$$\left(\frac{c_1}{n_{1a}} - 1\right)^2 = 1 - \frac{n_{10}}{n_{1a}}$$

$$\frac{c^2}{n_{1a}} + n_{10} = 2c$$

$$\frac{c^2}{4\beta} \frac{\left[1-\gamma' e^{a\sqrt{2\alpha\beta}}\right]^2}{\gamma' e^{a\sqrt{2\alpha\beta}}} + 4\beta \frac{\gamma'}{(1-\gamma')^2} = 2c \qquad \| \; n_{2a} + n_{10} = 2c$$

$$c \left[\frac{\gamma e^{a\sqrt{2\alpha c}} - 1}{\gamma e^{a\sqrt{2\alpha c}} + 1}\right]^2 = 4\beta\gamma' \frac{e^{a\sqrt{2\alpha\beta}}}{\left[1-\gamma' e^{a\sqrt{2\alpha\beta}}\right]^2} \qquad \| \; n_{2a} = n_{1a}$$

$$c\left\{ + \frac{\gamma e^{a\sqrt{2\alpha c}}}{\gamma^2 e^{2a\sqrt{2\alpha c}} - 1} - \frac{1}{2}\log\left[\frac{\gamma e^{a\sqrt{2\alpha c}} + 1}{\gamma e^{a\sqrt{2\alpha c}} - 1}\right]\right\} = \sqrt{\frac{\beta}{2\alpha}} \frac{\gamma' e^{a\sqrt{2\alpha\beta}}}{1-\gamma' e^{a\sqrt{2\alpha\beta}}} \qquad \| \; - = -$$

Dla małych c i β biorę $e^{a\sqrt{2\alpha c}} = 1 + a\sqrt{2\alpha c}$

II). $c \left[\frac{\gamma(1+a\sqrt{2\alpha c})-1}{\gamma(1+a\sqrt{2\alpha c})+1}\right]^2 \neq c\left(\frac{\gamma-1}{\gamma+1}\right)^2 = \frac{4\beta\gamma'}{(1-\gamma')^2}$

I). $c\left(\frac{\gamma+1}{\gamma-1}\right)^2 + \frac{4\beta\gamma'}{(1-\gamma')^2} = 2c$

III). $c\left\{ + \frac{\gamma}{\gamma^2-1} - \frac{1}{2}\log\left(\frac{\gamma+1}{\gamma-1}\right)\right\} = \sqrt{\frac{\beta}{2\alpha}} \frac{\gamma'}{1-\gamma'}$

$$\frac{4\beta\gamma'}{(1-\gamma')^2} \neq c \qquad \gamma \ne 0$$

$$\sqrt{\frac{\beta}{2\alpha}} \frac{\gamma'}{1-\gamma'} = c \qquad \frac{\sqrt{\beta}}{1-\gamma'} \neq \sqrt{2\alpha} \qquad \gamma' \sim c$$

$$\cancel{-U = \int \frac{\partial U}{\partial \omega} dx + \frac{4\pi\varepsilon}{K}\int_0^a dx \int_0^x n_1 d\xi + \int_a^\infty dx \int_a^x (n_1 - n_2) d\xi}$$

$$\text{II}.\quad c\left(\frac{y-1}{y+1}\right)^2 = \frac{4\beta y' e^{a\sqrt{2\alpha\beta}}}{\left[1 - y' e^{a\sqrt{2\alpha\beta}}\right]^2}$$

$$\cancel{\text{I}+\text{II}\quad 4\beta \left\{ \frac{y'}{(1-y')^2} + \frac{y' e^{a\sqrt{2\alpha\beta}}}{(1-y' e^{a\sqrt{2\alpha\beta}})^2} \right\} = 2c}$$

$$\cancel{\left(\frac{y-1}{y+1}\right)^2 = \frac{2 y' e^{a\sqrt{2\alpha\beta}}}{\left[1 - y' e^{a\sqrt{2\alpha\beta}}\right]^2} \frac{1}{\frac{y'}{(1-y')^2} + \frac{y' e^{a\sqrt{-}}}{(1-y' e^{a\sqrt{-}})^2}}}$$

$$\cancel{\left(\frac{y-1}{y+1}\right)^2 = \frac{2}{\frac{1}{(1-y')^2}\frac{(1-y' e^{a\sqrt{2\alpha\beta}})^2}{e^{a\sqrt{2\alpha\beta}}} + 1}}$$

$$\cancel{e^{\sqrt{2\alpha\beta}} < 1}$$

jak to mielone?

$$c^2 = \left[2c - \frac{4\beta y'}{(1-y')^2}\right]\frac{4\beta y'}{(1-y')^2}$$

$$\overbrace{n_{1a}} = n_{1a}$$

$$n_{1a} + n_{2a} = 2c$$

$$\frac{n_{2a}}{c} = \frac{2 n_{1a}}{n_{1a} + n_{10}}$$

$$= \frac{2}{1 + \frac{n_{10}}{n_{1a}}}$$

$$\cancel{\frac{n_{2a}}{c} = \frac{2}{1 + \frac{n_{10}}{n_{1a}}}}$$

$$\cancel{\frac{c}{n_{1a}} = \frac{2}{1 + \frac{n_{10}}{n_{1a}}}}$$

$$y' e^{x\sqrt{2\alpha\beta}} = \xi \qquad y e^{x\sqrt{2\alpha c}} = \eta$$

$$c\left[\frac{\eta_a - 1}{\eta_a + 1}\right]^2 = 4\beta \frac{\xi_\alpha}{(1-\xi_\alpha)^2}$$

$$c\left[\frac{\eta_a + 1}{\eta_a - 1}\right]^2 + 4\beta \frac{\xi_0}{(1-\xi_0)^2} = 2c$$

$$c\left\{\frac{\eta_a}{\eta_a^2 - 1} - \frac{1}{2}\lg\left(\frac{\eta_a + 1}{\eta_a - 1}\right)\right\} = \sqrt{\frac{\beta}{2\alpha}}\ \frac{\xi_a}{1-\xi_a}$$

$$\frac{1}{2}\left(\sqrt{c\, n_{2a}} - \sqrt{c\, n_{1a}}\right) - \frac{c}{4}\lg\left(\frac{n_{2a}}{c}\right)$$

$$= \frac{1}{2}\sqrt{\frac{n_{1a}\cdot \xi_a}{2\alpha}}$$

$$\cancel{n_{1a} = \frac{c}{4} \pm \sqrt{\frac{c}{2} n_{10} + \left(\frac{c}{4}\right)^2}}$$

$$\left\{\begin{aligned} &\underline{\underline{c^2}} = \left[2c - \frac{4\beta y'}{(1-y')^2}\right] \frac{4\beta y' e^{a\sqrt{2\alpha\beta}}}{\left[1-y' e^{a\sqrt{2\alpha\beta}}\right]^2} \\ &\underline{\underline{c}} - \frac{4\beta y' e^{a\sqrt{2\alpha\beta}}}{\left[1-y' e^{a\sqrt{2\alpha\beta}}\right]^2} - \frac{1}{2}\sqrt{\frac{4\beta y' e^{a\sqrt{2\alpha\beta}} \cdot c}{\left[1-y' e^{a\sqrt{2\alpha\beta}}\right]^2}} \left\{ \lg c - \lg \frac{4\beta y' e^{a\sqrt{2\alpha\beta}}}{\left[1-y \cdots\right]^2} \right\} \end{aligned}\right.$$

$$c - n_{1a} - \frac{\sqrt{n_{1a} \cdot c}}{2} \lg\left(\frac{n_{1a}}{c}\right) = n_1 \Theta \sqrt{\frac{\xi\theta}{2\alpha}} = \sqrt{\frac{\beta}{2\alpha}} \frac{y'}{1-y'}$$

$$= \sqrt{\frac{\beta}{2\alpha}} \frac{y'}{1-y'}$$

$$\beta = \cancel{\beta_0} + \beta_1 c + \beta_2 c^2$$

$$y' = \cancel{y_0} + y_1 c + y_2 c^2$$

$$n_{1a} = \frac{4\left[1 + a\sqrt{2\alpha\beta_1 c}\right]\left[y_0 + y_1 c\right] \beta_1 c}{\left[1 - (y_0 + y_1 c)(1 + a\sqrt{2\alpha\beta_1 c})\right]^2}$$

$$= c \left\{ 4\beta_1 \frac{\left[y_0 + a y_0 \sqrt{2\alpha\beta_1 c} + y_1 c\right]}{\left[1 - y_0 \underbrace{\left(1 + \frac{y_1}{y_0} c\right)\left(1 + a\sqrt{2\alpha\beta_1 c}\right)}_{\underbrace{1 + a\sqrt{2\alpha\beta_1 c} + \frac{y_1}{y_0} c}_{\left[1 - y_0 - a y_0 \sqrt{2\alpha\beta_1 c} - y_1 c\right]^2}}\right]^2} \right\}$$

$$= c \left\{ \frac{4\beta_1 y_0}{(1-y_0)^2} \left\{ 1 + a\sqrt{2\alpha\beta_1 c} + \frac{y_1}{y_0} c \right\} \left\{ 1 - a\frac{y_0}{1-y_0}\sqrt{2\alpha\beta_1 c} - \frac{y_1}{1-y_0} c \right\}^{-2} \right.$$

$$(1-x)^{-2} = 1+2x+\frac{-2\cdot -3}{1\cdot 2}\cdot x^2$$

$$\cancel{= c\cdot\frac{4\beta_1\gamma_0}{(1-\gamma_0)^2}\left\{1 + a\sqrt{2\alpha\beta_1 c}\,\frac{1+\gamma_0}{1-\gamma_0} + \frac{\gamma_1}{\gamma_0}c + \frac{2a^2\gamma_0}{1-\gamma_0}\,2\alpha\beta_1 c + \frac{2\gamma_1}{1-\gamma_0}c + 3\frac{a^2\gamma_0^2}{(1-\gamma_0)^2}\cdot 2\alpha\beta_1 c\right\}}$$

$$\cancel{n_{1a} = \frac{4(\beta_0+\beta_1 c)\gamma_1 c\left[1 + a\sqrt{2\alpha(\beta_0+\beta_1 c)} + \cdots\right]}{\left\{1-\gamma_1 c\left[1+\cdots\right]\right\}^2}}$$

$$\sqrt{2\alpha(\beta_0+\beta_1 c)} = \sqrt{2\alpha\beta_0}\left(1+\frac{\beta_1}{\beta_0}c\right)^{1/2} = \sqrt{2\alpha\beta_0}\left(1+\frac{\beta_1 c}{2\beta_0}\right)$$

$$e^{a\sqrt{2\alpha\beta}} = e^{a\sqrt{2\alpha\beta_0}}\,e^{1+\frac{\beta_1 c}{2\beta_0}} = e^{a\sqrt{2\alpha\beta_0}}\left(1+\frac{\beta_1 c}{2\beta_0}\right)$$

$$n_{1a} = \underline{4(\beta_0+\beta_1 c)\gamma_1 c\, e^{a\sqrt{2\alpha\beta_0}}}\left(1+\frac{\beta_1 c}{2\beta_0}\right)\left[1+2\gamma_1 c\, e^{a\sqrt{2\alpha\beta_0}} + \cdots\right]$$

$$= c\cdot 4\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\left\{1+\frac{3\beta_1}{2\beta_0}c + 2\gamma_1 e^{a\sqrt{2\alpha\beta_0}}c\right\}$$

$$n_{10} = 4(\beta_0+\beta_1 c)\gamma_1 c\,(1+2\gamma_1 c) = 4\beta_0\gamma_1 c\left\{1+\frac{\beta_1}{\beta_0}c + 2\gamma_1 c\right\}$$

$$1 = \left[2 - 4\beta_0\gamma_1\left\{1+\left(\frac{\beta_1}{\beta_0}+2\gamma_1\right)c\right\}\right]4\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\left[1+\frac{3\beta_1}{2\beta_0}c + 2\gamma_1 e^{a\sqrt{2\alpha\beta_0}}c\right]$$

$$\underline{\underline{1 = 8\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\left[1-2\beta_0\gamma_1\right]}}$$

$$c - n_{1a} - \frac{1}{2}\sqrt{c\cdot n_{1a}}\cdot\log\left(\frac{c}{n_{1a}}\right) = \sqrt{\frac{\beta}{2\alpha}}\,\frac{\gamma'}{1-\gamma'}$$

7.

$$1-4\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\left[1+\frac{3\beta_1}{2\beta_0}c+2\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\cdot c\right]-$$

$$-\frac{1}{2}\sqrt{\beta_0\gamma_1}\, e^{\frac{1}{2}a\sqrt{2\alpha\beta_0}}\left[1+\frac{3\beta_1}{4\beta_0}c+\gamma_1 c\, e^{a\sqrt{2\alpha\beta_0}}\right]\left\{-a\sqrt{2\alpha\beta_0}-\lg 4\beta_0\gamma_1-\right.$$

$$\left.-\frac{3\beta_1}{2\beta_0}c-2\gamma_1 c\, e^{a\sqrt{2\alpha\beta_0}}\right\}$$

$$=\sqrt{\frac{\beta_0+\beta_1 c}{2\alpha}}\;\frac{\gamma_1}{1-\gamma_1 c}$$

$$=\gamma_1\sqrt{\frac{\beta_0}{2\alpha}}\left[1+\frac{\beta_1 c}{2\beta_0}+\gamma_1 c\right]$$

$$\begin{cases} 1-4\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}-\frac{1}{2}\sqrt{\beta_0\gamma_1}\, e^{\frac{a}{2}\sqrt{2\alpha\beta_0}}\left[\lg\frac{1}{4\beta_0\gamma_1}-a\sqrt{2\alpha\beta_0}\right]=\gamma_1\sqrt{\frac{\beta_0}{2\alpha}} \\ 1=8\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}\left[1-2\beta_0\gamma_1\right]\end{cases}$$

$$\beta_0\gamma_1 e^{a\sqrt{2\alpha\beta_0}}=\frac{1}{8(1-2\beta_0\gamma_1)}$$

$$1-\frac{1}{2(1-2\beta_0\gamma_1)}-\frac{1}{4\sqrt{2}}\frac{1}{\sqrt{1-2\beta_0\gamma_1}}\left[\lg\frac{1}{4\beta_0\gamma_1}-a\sqrt{2\alpha\beta_0}\right]=\frac{\gamma_1\beta_0}{2\alpha\sqrt{\beta_0}}$$

$$a\sqrt{2\alpha\beta_0}+\lg\beta_0\gamma_1=-\lg\left[8(1-2\beta_0\gamma_1)\right]$$

$$\lg a-\lg 4-\cancel{\lg\beta_0\gamma_1}+\lg 8+\lg(1-2\beta_0\gamma_1)$$

$$1 - \frac{1}{2(1-2\beta_0 y_1)} - \frac{1}{4\sqrt{2}\sqrt{1-2\beta_0 y_1}}\left[\lg 2 + \lg(1-2\beta_0 y_1)\right] = \frac{\beta_0 y_1}{2\alpha\sqrt{\beta_0}}$$

$$a\sqrt{2\alpha\beta_0} = -\lg\left[8(\beta_0 y_1)(1-2\beta_0 y_1)\right]$$

$$8\beta_0 y_1(1-2\beta_0 y_1) < 1$$

$$\frac{1}{1+x} = 1 - x + x^2 - \dots$$

$$\Delta U = 2\varphi_1 - \varphi_0 = \cancel{\int_0^a \frac{\beta y^1 e^{x\sqrt{2\alpha\beta}}}{1-2y^1}}$$

$$= 4\sqrt{\frac{\beta}{2\alpha}} \int_0^a \left[\frac{1}{1-y^1 e^{x\sqrt{2\alpha\beta}}} - \frac{1}{1-y^1}\right] dx +$$

$$+ \int_a^\infty 8c \left\{ \underbrace{\frac{-y e^{x\sqrt{2\alpha c}}}{2(y^2 e^{2x\sqrt{2\alpha c}}-1)}} + \frac{1}{4}\lg\left[\frac{y e^{x\sqrt{2\alpha c}}+1}{y e^{x\sqrt{2\alpha c}}-1}\right] - \dots \right\} dx$$

$$= \int_a^\infty 2c \left\{ \frac{-1}{y e^{x\sqrt{2\alpha c}}+1} + \frac{-1}{y e^{x\sqrt{2\alpha c}}-1} + \underbrace{\lg\left[y e^{x\sqrt{2\alpha c}}+1\right] - \lg\left[y e^{x\sqrt{2\alpha c}}-1\right]} \right\} dx$$

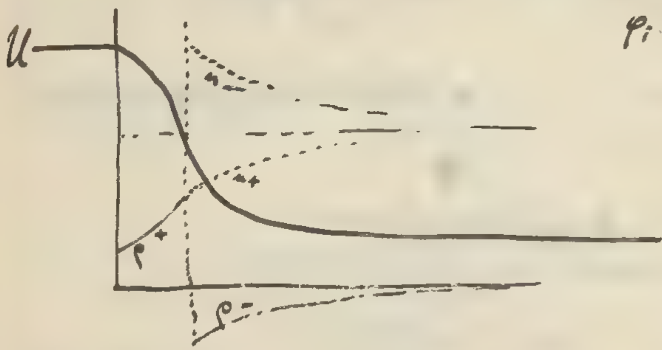
$$+ 2\left[\frac{1}{y} e^{-x\sqrt{2\alpha c}} + \frac{1}{3y^3} e^{-3x\sqrt{2\alpha c}} + \dots\right]$$

$$2c\left\{\frac{-1}{y} e^{-x\sqrt{2\alpha c}}\left[1 - \cancel{\frac{1}{y} e^{-x\sqrt{2\alpha c}}} + \frac{1}{y^2} e^{-2x\sqrt{2\alpha c}}\right.\right.$$

$$= 4c\int_a^\infty \left\{ -\frac{2}{3y^3} e^{-3x\sqrt{2\alpha c}} - \frac{4}{5y^5} e^{-5x\sqrt{2\alpha c}} \dots \right\} dx$$

$$= \frac{4c}{\sqrt{2\alpha c}}\left[\frac{2}{3^2 y^3} e^{-3a\sqrt{2\alpha c}} + \frac{4}{5^2 y^5} e^{-5a\sqrt{2\alpha c}} \dots\right]$$

W każdym razie przebieg potencjału taki:

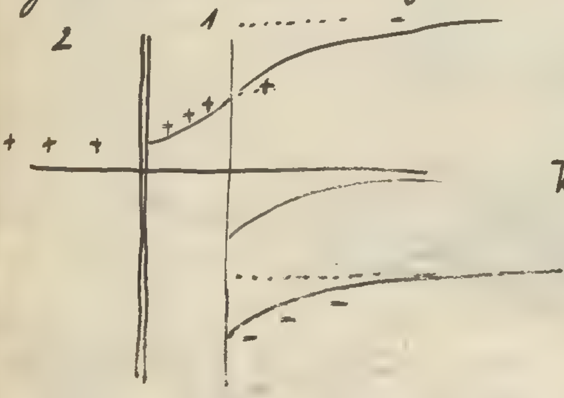


$\varphi_i - \varphi_a < 0$

więc odwrotnie jak przy szkle-wodzie

[ale nie wyjaśnia przyjęcie że warstwa a stale dodatnia przylega]

Jeżeli stała dielektr. zwany inna



wtedy $\left(\frac{\partial U}{\partial x}\right)_0 \geq 0$?

$$K_2 \frac{\partial^2 U_2}{\partial x^2} = 0$$

$$K_1 \frac{\partial^2 U_1}{\partial x^2} = -4\pi\varepsilon(n_1 - n_0)$$

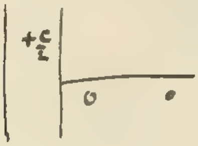
więc tylko musi być $\left(\frac{\partial U}{\partial x}\right)_0 = 0$

więc w całości równa ilość $\pm$ jonów

ale warunek III odmienny ?

Gdyby jednostajne rozmieszczenie, tak że U tylko $f(x)$ to dielektr. nie miałoby żadnego wpływu! Tylko gdy jony w takich odległościach od siebie że

Bdrzę w rachunku tak, dwie że wzajemne siły między jonami znikome



że w obydwu 0 ⟷ a gęstości stałe

$n_1 = \text{const}$

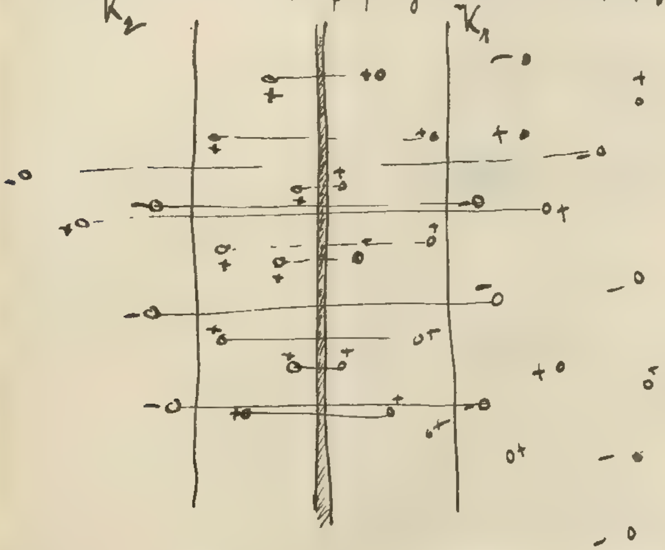
Natomiast gdy inne dielektr. wtedy $n_1 = n_{10} e^{-k\Phi_1}$ ‖ $n_2 = n_{20} e^{-k\Phi_2}$

Φ = energia wskutek potrzebna blisko granicy

wskutek obrazu w dielektr., z pominięciem wpływu innych jonów

$$\Phi = \frac{K_1 - K_2}{K_1 + K_2} \frac{(ve)^2}{x}$$

Wówczas wskutek wszystkich mamy $\Phi + U$



a po prawej stronie tak samo jak gdyby po lewej stronie symetrycznie stanowi masy

ale wszystkie opatrzone tylko $\frac{K_2 - K_1}{K_2 + K_1}$ ułamek

nadwyżki pierwotnych po prawej stronie

$\overline{\left(\frac{\partial U}{\partial x}\right)} = 0$ więc mamy $\Sigma n_1 = \Sigma n_2$

Stanowiące $\frac{e^2}{Kr} = 5.10^{-14}$

$$r = \frac{e^2\, 10^{14}}{5.K} = \frac{10^{-6}}{20}$$

= [illegible]

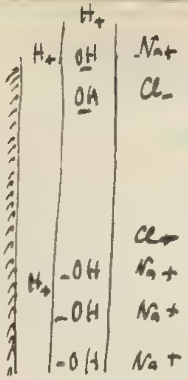
$= 5.10^{-8}$ cm

$\frac{K - K_1}{K + K_1} \frac{ee'}{r}$ ‖ $e = 4{,}6.10^{-10}$

$r = 4.10^{-8}$

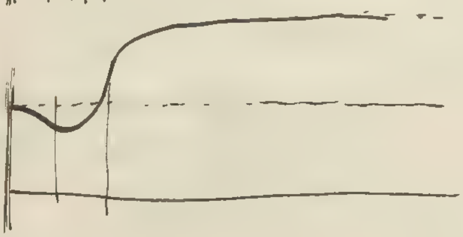
$W = 5.10^{-12}$

podobnie gdy średnia kinetyczna energia wynosi $= 5.10^{-14}$



v soustavách granicových zavse bývají iontové volné H, OH
neměl jich ale nebyli v středu cizy

Jinde nadmerné NaOH



} $\varphi_i - \varphi_a$ dodatečné

$$\frac{\partial^2 U}{\partial x^2} = \cancel{m} - \frac{4\pi n_1 \varepsilon}{K}$$

$$\frac{\partial U}{\partial x} = -\frac{4\pi n_1 \varepsilon}{K}\, x$$

$$U\Big|_a = -\frac{4\pi n_1 \varepsilon}{K}\,\frac{a^2}{2}$$

$$\frac{\partial U}{\partial x}\Big|_a = -\frac{4\pi n_1 \varepsilon}{K}\, a$$

$$\frac{\partial U}{\partial x} = -\frac{4\pi n_1 \varepsilon}{K}\, a + \int_a^x \varphi(x)\, dx = -\int_x^\infty \varphi(x)\, dx \qquad \int_a^\infty \varphi(x)\, dx = \frac{4\pi n_1 \varepsilon}{K}\, a$$

$$U = \cancel{\int_a^\infty dx \int_a^x \varphi(x)\, dx - \frac{4\pi n_1 \varepsilon}{K}\, a}$$

$$= -\int_a^\infty dx \int_x^\infty \varphi(x)\, dx = \left\{ x \int_x^\infty \varphi(x)\, dx \Big|_a^\infty - \int_a^\infty x\, \varphi(x)\, dx \right\}$$

für 1/1000 norm. Lösung

$$\frac{4\pi n_1 \varepsilon}{K} e^2 = \frac{\cancel{4}\pi}{\cancel{80}} \cdot \cancel{4} \cdot 10^{-16} \cdot \cancel{48} \cdot 10^{-10} \cdot \frac{1}{1000} \frac{1}{100} \cdot 7 \cdot 10^{23} \cdot 300$$

$$= 7 \cdot 10^{-4}$$

$$\kappa \cdot \quad \cdot - = 6 \cdot 10^{-2} = 0{\cdot}06$$

[illegible]

$(\ldots 2.15^{6})$

[illegible]

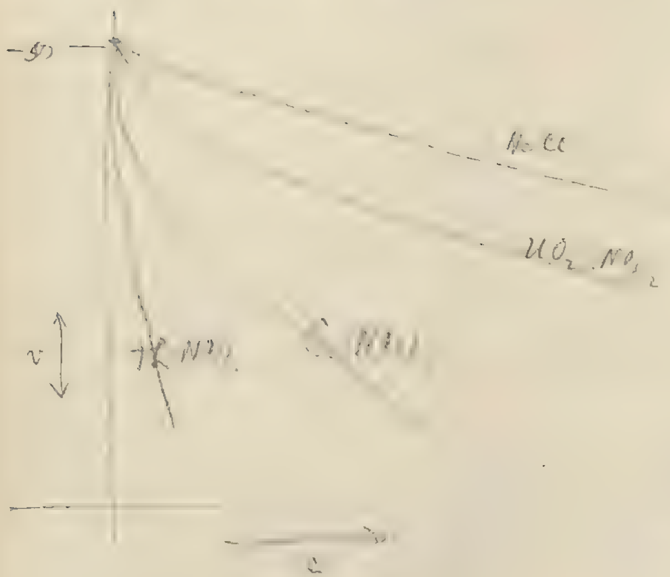
Cu NO [illegible]

[illegible]

abs. [illegible] 0.0 [illegible] 322 mol

[illegible]

Δv [illegible]



$v =$ [illegible]

$< 10\%$ [illegible]

K_2 10.

c	v
0	[illegible]
5	[illegible]
10	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

$\frac{1}{2}\,Cl_2$ [illegible]

$Hg\,Cl_2$ [illegible]

[illegible] $26.$[illegible]

[illegible]

[illegible] 23.22

[illegible] 4.22 [illegible]

c	[illegible]
0	[illegible]
20	[illegible]
60	5.3
150	[illegible]
200	[illegible]

c	[illegible]
[illegible]	[illegible]
[illegible]	1
[illegible]	0
0	[illegible]
0	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
2.6	[illegible]
4	10
5.3	[illegible]
6.6	[illegible]
10	[illegible] + [illegible]

!!

[illegible]

$\rho = 2.2$ [illegible]

[illegible]

c	v
0	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
1.7	0
2.6	[illegible]
	2 mm + [illegible]

NaOH

c	v
0	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
100	[illegible]

$$\begin{array}{r} 14 \\ 48 \\ \hline 62 \end{array} \qquad 18.$$

$$\begin{array}{r} 230 \\ 248 \\ 72 \\ \hline \end{array}$$

$$\frac{0.4 \cdot 550}{10^6}\ g = 0.2 \cdot 10^{-3}\ g$$

$$= 0.4 \cdot 10^{-9}\ \frac{g\ \mathrm{Mol}}{cm^3}$$

$$\cancel{= 0.4 \cdot 6 \cdot 10^{14}}$$

$$= 2.4 \cdot 10^{14}\ \frac{\mathrm{Th.Mol.}}{cm^3}$$

mittlere Abstand

10^{-5} cm

falls gleichmässig verteilt

$$\frac{e\,e'}{K\,r^2} = \frac{5 \cdot 10^{-20}}{10^{-5}} = \frac{5 \cdot 10^{-15}}{80}$$

pod wpływem jednego

energia kinet. = $5 \cdot 10^{-14}$

więc we wszystkich warstwach

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

c	[illegible]		[illegible]
$NaCl$	2.50		
	KNO	[illegible]	5.1
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
	$CaCl_2$	[illegible]	[illegible]
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
[illegible]	2.7	[illegible]	[illegible]

[illegible]

4). [illegible]

5). [illegible]

6). Corell. [illegible] interne [illegible]

[illegible]

2)

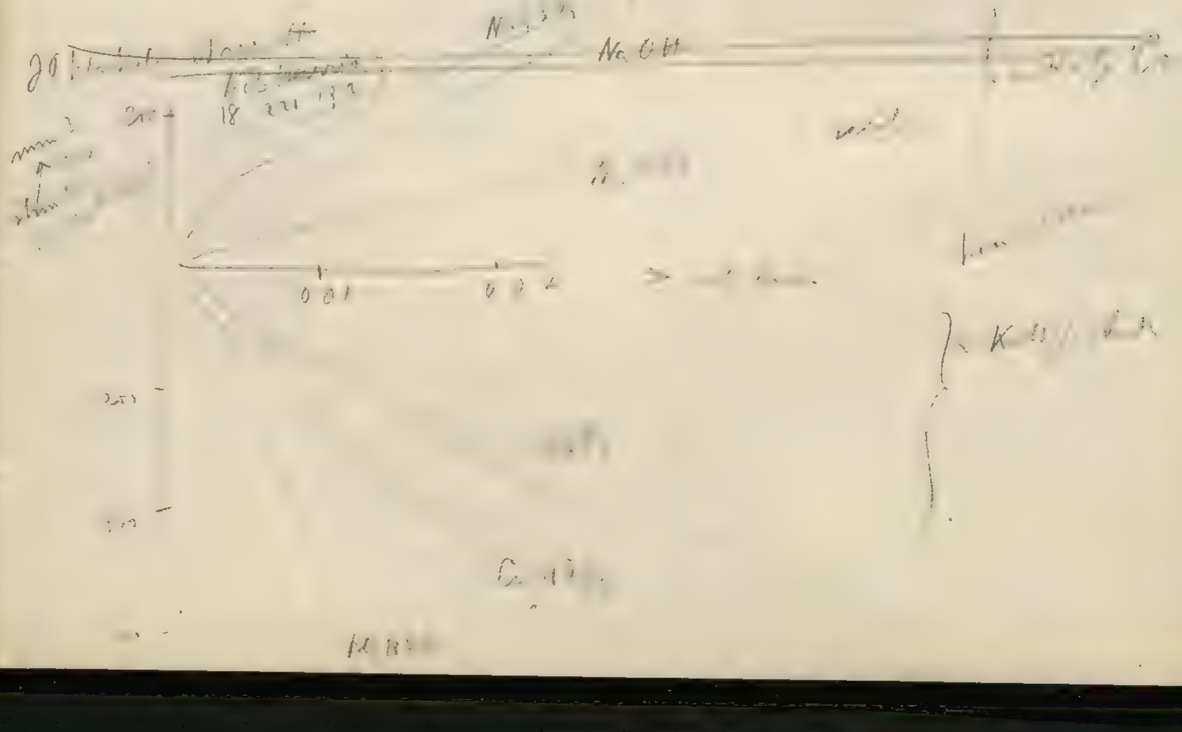
3)

4)

5)

NaOH

18 221 13?



[illegible]

V_{max} [illegible] mol. – 0·077 [illegible]

0.001 [illegible]

6 [illegible] 2, 3 [illegible] = 2.3 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

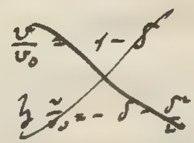
[illegible]

[illegible]

$$W(v)\,dv = b\, e^{\frac{v}{R\theta_0}\int_{v_0}^{v}(p-p_0)\,dv}\, dv \qquad = b\,e^{\frac{N}{H\theta}\cdot\frac{v}{N}\int_{v_0}\cdots}$$

$$p = \frac{R\theta}{v} \qquad \int_{v_0}^{v}\ldots = R\theta \lg\frac{v}{v_0} - \frac{R\theta}{v_0}(v-v_0)$$

$$W(v)\,dv = b\; e^{\nu\left[\lg\frac{v}{v_0}+1-\frac{v}{v_0}\right]}\,dv$$



$$= b\; e^{-\frac{N}{H\theta}\cdot\underbrace{\frac{\nu H\theta}{N}\left[\frac{v}{v_0}-1-\lg\frac{v}{v_0}\right]}_{P_2}}$$

$$n_\alpha = n_{\alpha 0}\, e^{-\frac{N}{H\theta}\Phi_\alpha}$$

$$\Phi_\alpha = \varepsilon w_\alpha U + P_2$$

$$\rho = \varepsilon \sum n_\alpha w_\alpha = -\frac{K}{4\pi}\frac{\partial^2 U}{\partial x^2}$$

$$n_\alpha = n_{\alpha 0}\, e^{-\frac{\nu\delta^2}{2}}\, e^{-\frac{N}{H\theta}\varepsilon w_\alpha U}$$

Np. jednowartościowy Anion CaCl$_2$
dwuwartościowy Kation

$w_1 = -1$

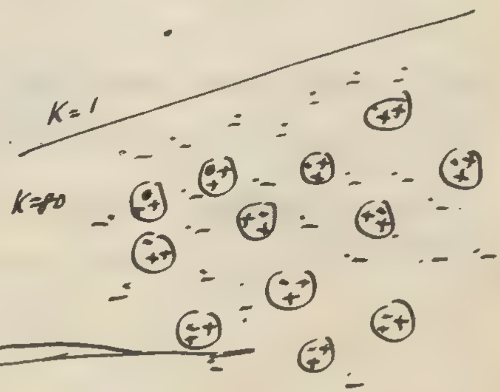
$w_2 = +2$

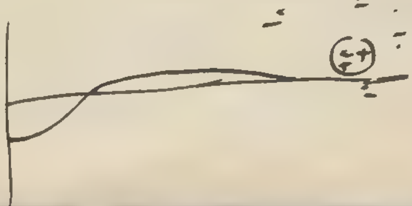
$\nu_1 = 2\nu_2 = \nu$

$$-\left[\frac{\nu_1\delta_1^2}{2} + \frac{N}{H\theta}\varepsilon U\right] = \lg(1+\delta_1)$$

$$-\left[\frac{\nu_2\delta_2^2}{2} + \frac{2N}{H\theta}\varepsilon U\right] = \lg(1+\delta_2)$$

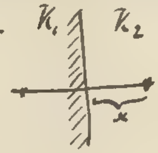
$$\varepsilon\left[\underbrace{-n_1 + 2n_2}_{\underbrace{-\nu(1+\delta_1)+\nu(1+\delta_2)}_{\nu(\delta_2-\delta_1)}}\right] = -\frac{K}{4\pi}\frac{\partial^2 U}{\partial x^2}$$





Pomijając wpływ pracy osmotycznej:

Dielektricum



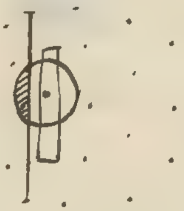
$$\Phi = \frac{K_1 - K_2}{K_1 + K_2} \frac{(\nu\varepsilon)^2}{2x} + [illegible] \int \rho \, d\xi \, (\sqrt{[illegible]} - x)$$

$$n_1 = n_{10} \, e^{-k\Phi}$$

Gdyby ładunki elektryczne były rozdzielone w sposób ciągły nie byłoby żadnego powodu do powstawania różnic potencyału na powierzchni.

Ale ładunki koncentrowane w jonach.

Jon podlega siłom takim (przybliżenie) jak gdyby została pustość była rozłożona ładunku w sposób ciągły, a tylko brakowało tych [illegible] w obszarze ile jego ładunek wynosi



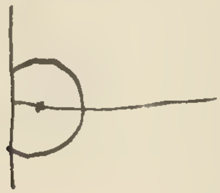
$$\rho = \varepsilon \left[N_c U_c v_c + \cdots - N_a U_a v_a \cdots \right]$$

$$\int dk = \frac{2\pi}{K} \left[\int_0^{x - \frac{1}{NU}} - \int_{x + \frac{1}{NU}}^{\infty} \rho \, dx \right]$$

Jeśli kationy i aniony mniejszych równomiernie rozdzielone, to mogą ładunki ~~[illegible]~~ zbliżony do pewnej punktu [illegible] siły 0. Natomiast sam kation doznaje siły takiej, jak gdyby z otoczenia jego wydzielono ładunek ε

we wszystkie przyciągają:

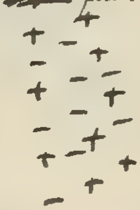
przy ściankach natomiast



więc przy powierzchni (względem środka o tej samej stałej dielektrycznej) przeważają siły elektryczne na kationy i aniony ku środkowi ciągnące
(tem większe im większa koncentracja)
z drugiej strony ciśnienie osmotyczne ciśnie je ku ściankom
w każdym razie warstwy powierzch. uboższe w iony
a to tem więcej jeśli zewnętrzna stała dielektr. jest mniejsza
O ile jednak oba {kat / an} iony równowartościowe nie powinno to dać powodu do potencjału HCl $CuSO_4$
warstwy podwójnej.
Jeśli zaś {kationy dwu / aniony 1} wartościowe to kationy silniej przyciągane podlegają sile elektr. niż osmot. zatem więcej się cofną we wnętrze cieczy
więc zewnętrzna warstwa będzie + / wewnętrzna − $CaCl_2$ $AlCl_3$

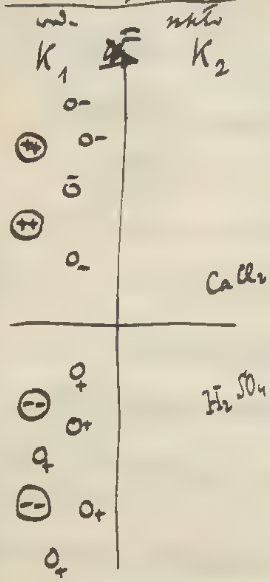
natomiast jeśli stała dielektr. zewnętrzna większa   znak może się odwrócić || tak samo

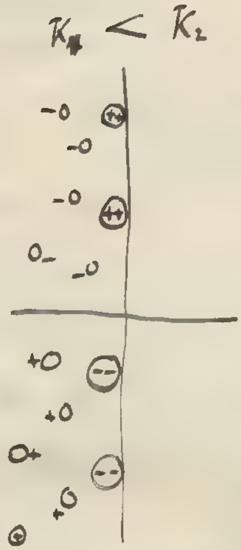
Tak samo i inna argumentacja
kationy nie zbliżają się znacznie do siebie prędzej: 1) wskutek przyciągania wzajemnego 2) elektrycznej
aniony względem kationów mają te efekty przeciwne i przeważają jedne nad drugimi
(inaczej nie byłoby dysocjacji)
ale zawsze w blizkości powierzchni
przewaga sił przyciągających anionów



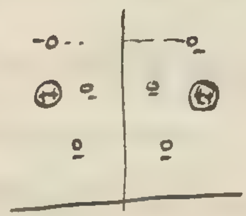
Każdy kation ma więcej anionów koło siebie niż kationów
Każdy anion ma więcej kationów koło siebie niż anionów

więc:





zdaje mi się że byłby odwrotny
efekt dla $K_1 = K_2$
niż $K_1 > K_2$ (pik!?)
bo w tym ostatnim razie tak jak gdyby obszary ...



Powracając do dawniejszych założeń według sposobu Gouy:

$$\rho = \varepsilon \left[N_c U_c v_c - N_a U_a v_a \right]$$

$$-F = \frac{2\pi}{K}\left[\int_x^\infty - \int_0^x \rho\, dx\right]$$

$0 < x < \alpha$

$$\rho = \varepsilon N_c U_c v_c \qquad -F_\infty = -\frac{2\pi}{K}\int_0^\infty \rho\, dx = 0$$

$$F = + \frac{4\pi}{K}\int_0^x \rho\, dx = -\frac{4\pi}{K}\underbrace{\int_x^\infty \rho\, dx}_{q}$$

$$\frac{4\pi q m}{KRT} = -\frac{1}{U_c v_c}\frac{\partial U_c}{\partial x} = \frac{1}{U_a v_a}\frac{\partial U_a}{\partial x} \qquad x > \alpha$$

$$U_c = U_{c0}\, e^{-\frac{4\pi m v_c}{KRT}\int q\, dx} = U_{c0}\, e^{\frac{m v_c}{RT}\int F dx}$$

$$\frac{4\pi q m}{KRT} = -\frac{1}{U_c v_c}\frac{\partial U_c}{\partial x} \qquad x < \alpha$$

$$\left.\begin{aligned} N_c(U_c - 1) + N_a(U_a - 1) &= \frac{2\pi}{KRT} q^2 \\ U_c^{\frac{1}{v_c}} &= U_a^{-\frac{1}{v_a}} \end{aligned}\right\} \quad x > a$$

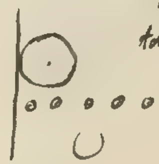
$$N_c U_c + \cancel{N_a U_a} = \frac{2\pi}{KRT} q^2 + \text{const} \qquad x < a$$

$$\left.\begin{aligned} N_c U_{c/\alpha} &= \frac{2\pi}{KRT} q_\alpha^2 + \text{const} \\ N_c(U_{c_\alpha} - 1) + N_a(U_{a\alpha} - 1) &= \frac{2\pi}{KRT} q_\alpha^2 \end{aligned}\right\}$$

czy istotnie warunek?

$U_{c/\alpha} = U_{c/\alpha}$

tak, wskutek dyfuzji!



$$\frac{\partial^2 U}{\partial x^2} = -4\pi\rho$$

$$\frac{\partial U}{\partial x} = -4\pi\int_0^x \rho\,dx$$

$$\Delta\varphi \cancel{U} = -4\pi\int_0^\infty dx\int_0^x \rho\,dx = 4\pi\;\cancel{x\int_0^x \rho\,dx} + \int_0^\infty \rho x\,dx$$

$$= 4\pi\left[\int_0^\xi n_1 x\,dx + \int_\xi^\infty (n_1-n_2)\,x\,dx\right]$$

$$= -4\pi\xi\int_0^a dx\int_0^x n_1\,dx + \int_a^\infty dx\left[\int_0^a n_1\,dx + \int_a^x (n_1-n_2)\,dx\right]$$

$$= \cancel{-4\pi\xi\int_0^\infty dx\int}$$

$$e^{x\sqrt{2\alpha\beta}} = z$$

$$x\sqrt{2\alpha\beta} = \lg z$$

$$dx = \frac{1}{\sqrt{2\alpha\beta}}\,\frac{dz}{z}$$

$$4\sqrt{\frac{\beta}{2\alpha}}\int\frac{dx}{1-y'\,e^{x\sqrt{2\alpha\beta}}}$$

$$= \int\frac{dz}{z\,(1-y'z)}$$

Kitchen [illegible] E ; [illegible]

[illegible] = 2

Duclaux [illegible] CR 152 ; 1170 [illegible]

[illegible] $\frac{1}{100}$ [illegible] 2000 [illegible]

[illegible] CR 152 ; [illegible]

[illegible] 1430

[illegible]

van der Vaart [illegible]

[illegible] CR 153 ; [illegible]

Hydrog. [illegible]

[illegible]

Hadamard [illegible]

Michaud, p. [illegible] [illegible] [illegible] — 5 9 168 M.
[illegible]

[illegible] 276 [illegible] — père membre de l'assemblée [illegible]

[illegible]

[illegible] [illegible]

[illegible], neût [illegible]

[illegible] Terreur [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

ne pouvant [illegible]

[illegible]

[illegible]

[illegible] réclame [illegible]

sa bonté [illegible]

[illegible]

[illegible] comme [illegible]

[illegible]

2) [illegible]

3) [illegible]

4) [illegible]

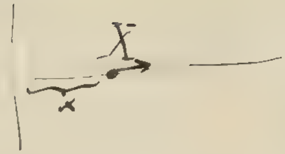
5. [illegible] publié par [illegible] [illegible]

1833 [illegible]

Fayolle [illegible]

78V

$\cancel{2\int 2\pi \ldots d\varphi\, dx} \cos\varphi$ Grenz



$$\rho = m\left[N_c U_c v_c - N_a U_a v_a\right]$$

$$X = \frac{2\pi}{K}\left[\int_0^x \rho\, dx - \int_x^\infty \rho\, dx\right] + f(K\,K_1)\int_0^\infty \rho\, dx$$

o ile dasis simil

$$J = \int \frac{\partial\phi}{\partial n}\,\frac{2\pi \ldots}{6}\, d\varphi\, a^2 = \frac{K(\varphi_i - \varphi_0)}{\cancel{4\pi}}\, \cancel{4\pi a^2}\, \frac{R^3}{3\eta}\, \rho\, \frac{g}{R^3} \int_0^{\frac{\pi}{2}} \cancel{\ldots \cos\varphi\, d\varphi}$$

$$= \frac{1}{6}\, K(\varphi_i - \varphi_0)\, \frac{a^2\, \rho\, g}{\eta}$$

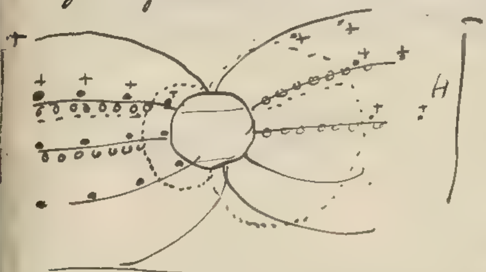
Strömungsströme mit Benützung von Glas und Metallröhren und durchlochten Flüssigkeiten! Reibungs Elektr.! Diaphragmen

Bei Verg Atmosphäre ... $\Big\}$!
...

O ile wpływa własne przewodnictwo cząstek (materiał zamknięty w elektrolicie)

nie wpłynęłoby o ile oba przewodniki w rodzaju przewodników metalicznych

Jeżeli jądro metal w elektrolicie o bardzo wielkiej różnicy szybkości wędrowania jednego jonu względem drugiego:



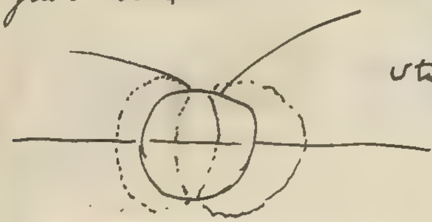
to się zróżni po jednej stronie elektrody część od drugiej.

więc w otoczeniu będzie wypadkowa siła pchająca ku +
równe przeciwnie oporom od elektrolitu

Przeciwnie jeżeli gorszy przewodnik w takim samym elektrolicie

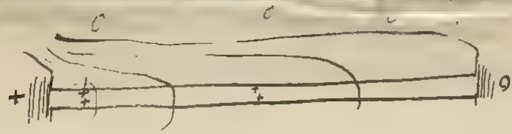
wtedy nagromadzi się na jego powierzchni w pierwszej chwili więcej H albo OH
aż się utworzy stan równowagi

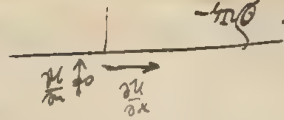
Jeżeli elektrolit w elektrolicie



wtedy (których) szybkości wędrowania składowe wpływają

Opór tego składowa pływająca na powierzchni metal.





$$-4\pi\rho = \frac{\partial}{\partial n}\left(K\frac{\partial U}{\partial n}\right) + \frac{\partial}{\partial x}\left(K\frac{\partial U}{\partial x}\right)$$

Im Innern von Körpern wo λ oder K veränderlich ist, tritt ρ auch bei stationärem Zustand auf.

Ogólny przypadek dwuwymiarowy

$$-4\pi\rho = \frac{\partial}{\partial x}\left(K_y\frac{\partial U}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_y\frac{\partial U}{\partial y}\right) = K\left(\frac{\partial^2 U}{\partial x^2} + \frac{\partial^2 U}{\partial y^2}\right) + \frac{\partial K}{\partial y}\frac{\partial U}{\partial y}$$

$$\lambda_y\frac{\partial U}{\partial x} = \text{const}$$

$$\frac{\partial}{\partial x} \qquad \lambda\frac{\partial^2 U}{\partial x^2} = 0$$

Właściwie: $\int \lambda\frac{\partial U}{\partial x}\,dy + \int \rho\, u\, dy = \text{const}$

Siła mechaniczna: $X = \rho\frac{\partial U}{\partial x}$ $\qquad -4\pi\rho = \frac{\partial}{\partial y}\left(K\frac{\partial U}{\partial y}\right)$

$$= \mu\frac{\partial^2 u}{\partial y^2} \quad \text{albo właściwie} \quad = \frac{\partial}{\partial y}\left(\mu\frac{\partial u}{\partial y}\right)$$

$$\mu\frac{\partial u}{\partial y} = \int^{\varepsilon}\rho\frac{\partial U}{\partial x}\,dy = -\frac{1}{4\pi}K\frac{\partial U}{\partial y}\cdot\frac{\partial U}{\partial x} + \frac{1}{4\pi}\int K\frac{\partial U}{\partial y}\frac{\partial^2 U}{\partial x\,\partial y}\,dy$$

$$\mu u\Big|_1^2 \mp \iint \rho\frac{\partial U}{\partial x}\,dy\,dy =$$

Cotton Suszeptibilität sollte sein: $\quad \frac{k_x}{k_{Luft}} = \frac{1-\frac{D_{xL}}{D_x}}{1-\frac{D_{xL}}{D_{Luft}}} = \frac{D_{Luft}}{D_x}\,\frac{D_x - D_{xL}}{D_{Luft}-D_{xL}}$

falls

Czy dokr. ruchu kapil. zachodzi krytycznym?

$r = 0{\cdot}1\,\mathrm{mm} = 10^{-2}$

$l = 15$

$p = 0{\cdot}8$ atm.

$\mu = 0{\cdot}01$

$$w = \frac{\frac{\pi r^4}{8\mu}\frac{p}{l}}{r^2\pi} = \frac{r^2}{8\mu}\frac{p}{l}$$

$$= \frac{10^{-4}}{8 \cdot 0{\cdot}01}\,\frac{0{\cdot}8 \cdot 10^6}{15} = \frac{1}{1{\cdot}5}\,10^2 = 66\,\frac{\mathrm{cm}}{\mathrm{sek}}$$

~~warun~~ Krytyczny: $\frac{w\,r}{\mu} < 1000$

$\frac{66 \cdot 0{\cdot}01}{0{\cdot}01} < 1000$ spełnione!

Rozproszenie promieni w ~~koloid.~~ emulsjach

10

$c = \frac{4}{3}\pi a^3 n$

$n = \frac{\cancel{3}\,c}{4a^3\cancel{\pi}}$

$$\frac{S}{\varphi} = \cancel{\ldots} = a\pi\, n^{2/3}$$

$$= \frac{4\pi}{a^2}\left(\frac{c}{4}\right)^{2/3} = \frac{\pi}{a}\left(\frac{c}{4}\right)^{2/3}$$

zatem wobec tego $\Phi = \frac{K(\varphi_1-\varphi_0)}{4\pi\eta}\, 6 \cdot \frac{3}{2} V R \cdot \frac{\cos\varphi}{r^2} = \frac{K(\varphi_1-\varphi_0)6}{4\pi}\cdot\frac{3}{\cancel{9}}\frac{\cancel{2}(\rho-\rho_1)gR^3}{\eta}\cdot\frac{\cos\varphi}{r^2}$

$V = \frac{2}{9}\frac{\rho g R^2}{\eta}$

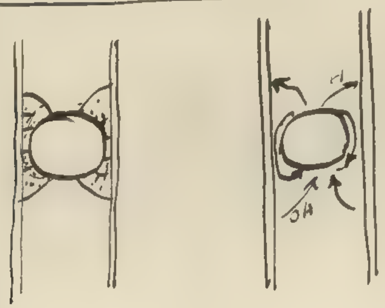
To innym jest w wartości rzecz; tam ΔP prąd i na kulę mały wszystko, tylko w

elektrości jej samej równe

o ile prawie zgodnie rzecz : $\Delta P = \cancel{M}g = \frac{4}{3}\pi R^3(\rho-\rho_1)g$

(wszystkie obliczenia zadowalające)!

Dorn, Billitzer



$$6 = \frac{4\pi\eta}{K(\varphi_1-\varphi_0)}\frac{E}{P} = \frac{4\pi \cdot 0{\cdot}01 \cdot 0{\cdot}005 \cdot 10^{-6}}{4} = 1{\cdot}5 \cdot 10^{-9}\ [1+\omega)$$

$V \cdot \eta = \frac{1}{6} = 10^{-6}$ (Ohm) $= 10^{-15}$ (em)

$6 = \cancel{10^{6} \cdot 9 \cdot 10^{11}} = 10^{15}$ em $= \frac{1}{9} \cdot 10^{-6}$ (est) $= 10^{-6}$

Quantitative Ursache!

Quantitative Elektrosmose in Nichtleitern!

Beeinflussung der
(Elektrosmose durch statische Oberflächen Ladung!

$\Phi = \cancel{\ldots}$

$\frac{2}{\cancel{300}}\ \frac{10^{-7} \cdot 10^{2}}{\cancel{3 \cdot 001}}\ a = 2a \cdot 10^{-5}$ est.

~~Heizung~~ Erhaltung d. Elektricitätsmenge mit Berücksichtigung d. convectiven Strömung

$$\frac{\partial(\varepsilon u)}{\partial x} + \frac{\partial(\varepsilon v)}{\partial y} + \frac{\partial(\varepsilon w)}{\partial z} \cancel{+ \lambda \nabla^2 \Phi} + \frac{\partial}{\partial x}\left(\lambda \frac{\partial \Phi}{\partial x}\right) + \frac{\partial}{\partial y}\left(\lambda \frac{\partial \Phi}{\partial y}\right) + \frac{\partial}{\partial z}\lambda(\quad) = 0$$

$$u \frac{\partial \varepsilon}{\partial x} + v \frac{\partial \varepsilon}{\partial y} + w \frac{\partial \varepsilon}{\partial z} + \lambda \nabla^2 \Phi + \frac{\partial \lambda}{\partial x}\frac{\partial \Phi}{\partial x} + \frac{\partial \lambda}{\partial y}\frac{\partial \Phi}{\partial y} + \cdot = 0$$

wystarczy napisać:

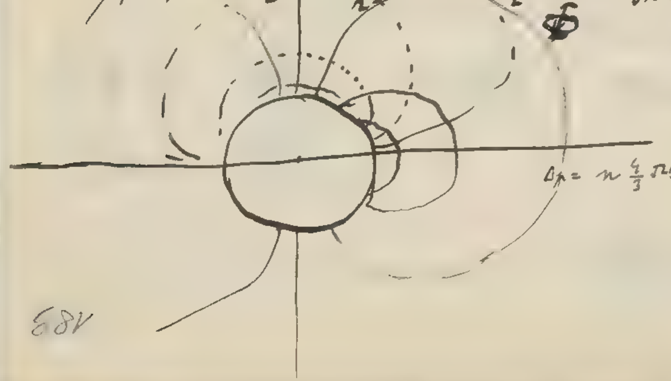
$$\left.\begin{aligned} \varepsilon u &= -\lambda \frac{\partial \Phi}{\partial x} \\ \varepsilon v &= -\lambda \frac{\partial \Phi}{\partial y} \\ \varepsilon w &= -\lambda \frac{\partial \Phi}{\partial z} \end{aligned}\right\} \qquad \begin{matrix} u \\ v \\ w \end{matrix} = -\frac{\lambda}{\varepsilon}\left(\nabla(\Phi - \Phi')\right)$$

patrz Lamb. p. 193; tam λ uważane za stałe; czy to ~~...~~ w rzeczy powoduje elektrolityczne doświadczenia? Wówczas trudnoby byłoby inaczej wyjaśnić.

~~Kropelka~~ Kula poruszająca się względem V wśród Pot. $V_2 - V_1 = \frac{K(\varphi_1 - \varphi_2)}{4\pi\eta}\sigma(p_2 - p_1)$

$$p_2 - p_1 = -\frac{3}{2}\eta\frac{VR\,x}{r^3} = \frac{3}{2}\eta VR\frac{\partial}{\partial x}\left(\frac{1}{r}\right) = \frac{3}{2}\eta VR\frac{\cos\varphi}{r^2}$$

Φ



$\Delta p = n\frac{4}{3}\pi R^3 g(\rho - \rho')\,l$

$\frac{\cos\varphi}{r^2} = \mathrm{const} = \alpha$

$\cos\varphi = \alpha r^2$

$x = \alpha r^3$

$x^2 = \alpha^2(x^2+y^2)^3$

$y^2 + x^2 = \left(\frac{x^2}{\alpha^2}\right)^{1/3}$

$y^2 = \sqrt[3]{\left(\frac{x^2}{\alpha^2}\right)} - x^2$

58V

$2R\pi$ $\frac{\partial\varphi}{\partial x}$ $\int \varepsilon$ $\qquad \bar{u} = \frac{\varphi_i - \varphi_0}{4\pi d \eta} \frac{J6}{R\pi} \cdot \xi$

$$\frac{2R\pi \;\; \bar{u}}{J} \frac{\varphi_i - \varphi_0}{4\pi d} = \left(\frac{\varphi_i - \varphi_0}{4\pi d}\right)^2 \frac{2R\pi}{(R^2\pi)} \frac{6\,\xi}{\eta}$$

$$= \left(\frac{\varphi_i - \varphi_0}{4\pi d}\right)^2 \frac{2}{R} \frac{\xi 6}{\eta}$$

Ohmsche Leitung

$$= \frac{(\varphi_i - \varphi_0)^2}{8\pi^2 R} \cdot \frac{6}{\eta d}$$

Annahme $\varphi_i - \varphi_0 = \frac{1}{300}$ Volt $= \frac{1}{100}$

$6 = \frac{10^{15}}{9 \cdot 10^{11}}$

$R = \frac{1\,\text{mm}}{100} = 10^{-3}$

$6 = 0{\cdot}01$

$$\frac{10^{-4} \cdot \frac{10^4}{9}}{8 \cdot \pi^2 \cdot 10^{-3} \cdot 10^{-2}\, d} = \frac{10^2}{d}$$

$d \leq 10^{-5}$

eine Spannung ... $\lambda = 10^{-8}$

$$\lambda \int_z^\infty \varepsilon = \mu \frac{\partial u}{\partial z} \qquad i = \int_0^\infty \varepsilon u \, dz = K \int_0^\infty \frac{\partial^2 \varphi}{\partial z^2} u \, dz = K \left| \frac{\partial\varphi}{\partial z} u - \int \frac{\partial\varphi}{\partial z} \frac{\partial u}{\partial z} dz \right|$$

$$= K \frac{\partial u}{\partial z} + K \int \varphi \frac{\partial^2 u}{\partial z^2} dz$$

$\lambda \varepsilon = -\mu \frac{\partial^2 u}{\partial z^2}$

$\lambda K \frac{\partial^2 \varphi}{\partial z^2} = -\mu \frac{\partial^2 u}{\partial z^2} \qquad = K \int \left(\frac{\partial\varphi}{\partial z}\right)^2 dz$

$\lambda K (\varphi - \varphi_0) = -\mu u$

Chemische Elektromotoren bei oszillatorischer Entladung

Dicke der Doppelschichte; bei Verkleinerung der Capillaren muss schliesslich Grenze für die Gültigkeit der H. Formeln eintreten.

El. Leitfähigkeit von binären Mischungen von Nichtelektrolyten, Änderung in der Nähe des kritischen Trennungspunktes.

Zakrzewskiego dośw. $\ominus)(\oplus$

Niebezpieczeństwo przez warstwę szkła ; pot. zależy od jej grubości

---

Cała teorya Helmholtza zostałaby nie zmieniona gdyby Doppelsch. nie zawierała jednakowych ± (Millikan)

tylko różnica występowałaby w Kataphorezie!

Gdyby np. powierzchnia (np.) ~~...~~ nadmiar ładunku jednego rodzaju to musiałoby to powodować ruch kuli z otoczeniem jako całość, proporcjonalny do $\frac{4\pi a^2}{6\pi\mu a} \sim a$

więc kule większych rozmiarów szybsze niż małe.

Odstępy jonów ?

K_2SO_4 potrzeba $153.10^{-6} \frac{gr\,mol}{cm^3}$ do zneutralizowania

$$\frac{150.10^{-6}.\,9560.\,3\,10^{10}}{3.10^{-10}} = 150.10^{-6}.\,10^{24} = 0{\cdot}15.\,10^{21}$$

$$0{\cdot}153.\,10^{-3}.\,174$$
$$= 0{\cdot}15.\,0{\cdot}17$$
$$= 0{\cdot}024 = \frac{1}{40}$$

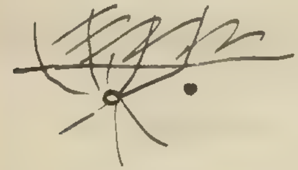
$$\delta = \frac{1}{\sqrt[3]{150.10^{18}}} = \frac{1}{5.10^{6}}\,.\,cm$$

$K_6(FeCy_6)_2$ już 10^{-6} wyraźnie wpływa : $\delta = 10^{-6}\,cm$

Różnica w koncentracji jonów w bliskości powierzchni   Jony!

Musi także wpływać dielektryk graniczący na ten rozkład

oraz dielektr. rozpuszczalnika



wpływ uwarstwowania) ?
dodatku prostego)

czemu tylko H / OH Jony, a inne bezczynne?

czy to co jest na zewnątrz wszystko jest ruch Brown'owski   czy ciśnienie osmotyczne?

↓ w związku z zmianami

Stan równowagi, jeśli wędrówka wskutek spadku koncentracji na zewnątrz =
wędrówce wskutek spadku siły elektr. na zewnątrz

[albo: jeśli spadek ciśnienia osmot. = $n E e$ elektr.?]

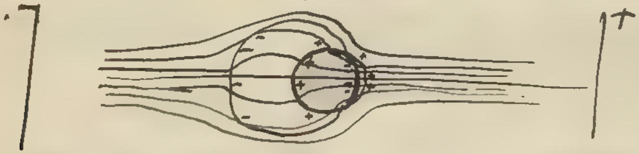
albo bezpośrednio z wzoru Nernst – Helmholtz.

$$E = \frac{u-v}{u+v} RT \lg \frac{c_1}{c_2} \quad ?$$

r5v

es entsteht ein asymmetrischer Stromlinienverlauf

Falls Leitf. d. reinen Körpers unterhalb ... Raum auf der rechten Seite verschwindend klein:



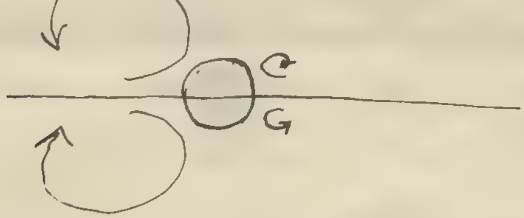
Ponderomot. Kräfte auf diesen El. Mengen von aussen her würden vielleicht als Summe Null geben. Genauere Untersuchung!

im Falle $K=1$

Aber ausserdem entstehen hierdurch Strömungen in der Flüssigkeit selbst

werden hierdurch nicht (nachteilende) Kraftwirkungen hervorgerufen?

Strömungen:



Experimentelle Entscheidung?

Kataphoretischer Nullpunkt ob auch für d. Endosmose gültig und für Strömungsströme

Überhaupt ist Theorie d. Strömungsströme von diesem Unsicherheiten ganz frei!

Derartige Experim. sind also viel verlässlicher

Jeder Einfluss von Polarisation und freien Ladung ist dort ausgeschlossen

$\boxed{\text{wenn } K = 1}$

$$F = \int \rho \frac{\partial U}{\partial x}\,dx = +\frac{1}{4\pi}\int \left(\frac{\partial U}{\partial x}\right)^2 \frac{\partial U}{\partial x}\,dx = -\frac{1}{4\pi}\int\left(\frac{\partial^2 U}{\partial x^2}\,\frac{\partial U}{\partial x}\right)dx$$

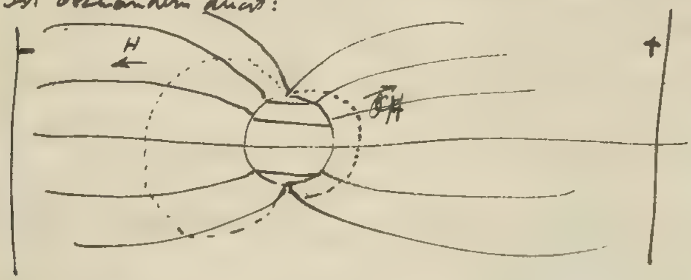
$$= -\frac{1}{8\pi}\left\{\int \left(\frac{\partial U}{\partial x}\right)^2 \Big| \right\} = \frac{1}{8\pi}\left(\frac{\partial U_1}{\partial x}\right)^2\left[1-\left(\frac{\lambda_1}{\lambda_2}\right)^2\right]$$

Ganze Helmholtz'sche Theorie nur giltig falls Doppelschicht ganz innerhalb der Flüssigkeit liegt was mit Freundlich p. 258 übereinstimmt; in diesem Fall ist U konstant und zwar gleich dem der Flüssigkeit

---

reine Beziehung der Kataphorese ist jedenfalls auf Metallpartikeln nicht anwendbar, denn Stromlinien sind ja ganz verschieden falls die Kugel leitend ist

Ist etwa anders direkt:

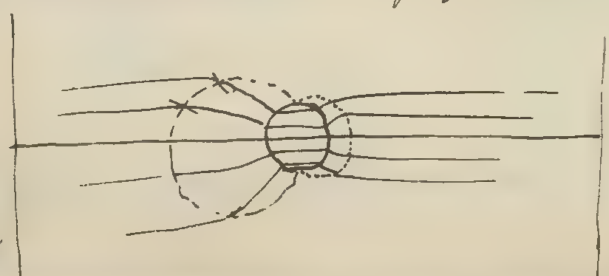


Das gilt aber nur im ersten Moment, falls die innere Flüssigkeit ein Elektrolyt ist (HCl)

denn dann werden auf der linken Seite OH angehäuft auf der rechten ebensoviel H

linke Seite wird ~~an H Ionen, rechts an OH Ionen~~ und rechte vom Elektrolyten entblösst ~~aber~~

also wird die Flüssigkeit in der Umgebung schlechter leitend und es tritt Änderung der Kraftlinien ein



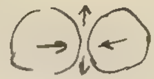
und an den ~~Punkten~~ Grenzflächen

treten ~~freie~~ wahre Ladungen auf!

7.8V

Flockung:

Vereinigung wird verhindert durch (innere Reibung und) Doppelschicht denn diese bewirkt ponderomotor. Kräfte welche dem Zusammenschieben der Teilchen entgegenwirken



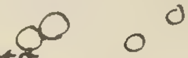
[Im allgemeinen bewirkt die Doppelschichte
~~[illegible]~~ eine scheinbare Vermehrung der Reibung]

daher Flockung erleichtert ~~[illegible]~~ im isoelectr. Punkt Freundlich p. 347

Brown'sche Bewegung wird durch Doppelschichte verlangsamt! — sollte daher im isoelectr. Punkt ein Maximum haben

Brown'sche Bewegung wirkt vereinigend?

Widerstand zweier nahe befindlicher Teilchen geringer als entspr.?



Beobachtung Freundlich p. 342 dass Wanderungsgeschw. nach Durchlaufen des $\frac{1}{3}$ der Elektrodendistanz (p. 338) sich plötzlich ändert:

rührt wohl davon her dass die unteren $\frac{2}{3}$ in derselben Zeit von H Ionen entblösst worden sind, also anfangs die Teilchen sich in H, OH Wasser, später nur in OH Wasser bewegen. Ist dadurch $\Delta\varphi$ verändert oder ist da ein spezifischer Einfluss tätig?

Elektrostatische Druckkräfte in Leitern von wechselndem Leitvermögen

$$\lambda \frac{\partial \varphi}{\partial x} = \text{const}$$

$$\frac{\partial \lambda}{\partial x}\frac{\partial \varphi}{\partial x} + \lambda \frac{\partial^2 \varphi}{\partial x^2} = 0$$

$$-4\pi\rho = \frac{\partial}{\partial x}\left(K \frac{\partial \varphi}{\partial x}\right) = \frac{\partial K}{\partial x}\frac{\partial \varphi}{\partial x} + K \frac{\partial^2 \varphi}{\partial x^2}$$

$$= \frac{\partial \varphi}{\partial x}\left[\frac{\partial K}{\partial x} - \frac{K}{\lambda}\frac{\partial \lambda}{\partial x}\right]$$

$$= K \frac{\partial \varphi}{\partial x} \cdot \frac{\partial}{\partial x}\left(\lg\left(\frac{K}{\lambda}\right)\right)$$

also $-4\pi\sigma = -K_1 \frac{\partial \varphi_1}{\partial x} + K_2 \frac{\partial \varphi_2}{\partial x}$

$$\lambda_1 \frac{\partial \varphi_1}{\partial x} = \lambda_2 \frac{\partial \varphi_2}{\partial x}$$

$$= \frac{\partial \varphi_1}{\partial x}\left[-K_1 + \frac{K_2 \lambda_1}{\lambda_2}\right] = -K_1 \frac{\partial \varphi_1}{\partial x}\left[\frac{K_2}{K_1}\frac{\lambda_1}{\lambda_2} - 1\right]$$

Czy elektrolity mają [illegible] [illegible] przewodnika [illegible] [illegible] [illegible]?

Vergl. Lundström Ann 5 p 729 (1901) [illegible] p. 240

Walden Z. ph. Ch. 54 p. 129 (1906) Dissoz. eines Salzes in versch. Lösungsmitteln
Zusammenhang mit Dielektr. Constante

E.61

[illegible] 2 pl. [illegible] 75 [illegible]

9410
II

(Jellinek p. 262)

Molekularwärme H_2 nach Eucken:

35°	2·98
40	2·98
45	3·00
50	3·01
60	2·99
65	3·04
70	3·10
80	3·14
82	3·19
85	3·21
90	3·26
91	3·25
100	3·42
110	3·62
196·5	4·39
273·1	4·84

Lyman Nature 93, 241, 1914

Spektrum bis 905 (Konkavgitter); untersucht damit Wasserstoff. teilw. Bestätig. der Resultate von Ritz

Fabry & Buisson Exp. [illegible] Doppler-Effekt

CR 158 p. 1498, 1914 [illegible] Hg Lampe [illegible]

[illegible] Fabry-Perot Etalon. [illegible] 120 [illegible] 220 [illegible]

H. Schimank [illegible] Temp. Ann. 45, 706, 1914

[illegible] pv-Werte

J. Nordlund Zeits ph Ch 87, 40, 1914 Eine neue [illegible] Avog. Konst. [illegible]

[illegible] Hg [illegible]

photogr. Registrierung fallender Hg Tröpfchen, [illegible] elektr. Zerstäubung [illegible] sedimentieren

lang. [illegible] [? [illegible] ?] Formel v. Stokes, [illegible] Rybcz. [[illegible] 205

A f. M. g. - Svensk. Ak. Bd. 9 No 13 (1913)] und [illegible] Boussinesq. [Ann. chim phys. 29, 349, 1913]] [illegible] - Sinkgeschwindigkeit

Glaskammer, [illegible] Glaskammer [illegible] fluorescein; [illegible] 38 cm [illegible]

[illegible] [[illegible] Zeunte, [illegible] 10 [illegible]!]

Resultat $N = 5{,}91 \cdot 10^{23}$

R. Ch. Tolman The specific heat of solids and the principle of similitude Phys. Rev. 4, 145, 1914

Derives by simple similitude, without use of „Quanta" an equation according as to form with Debye's only for low temperatures

$$c = 4AV\rho^{3/2}\chi^{3/2}\left\{B\left(\frac{2(1+\sigma)}{3(1-2\sigma)}\right)^{3/2} + \left(\frac{(1+\sigma)}{3(1-\sigma)}\right)^{3/2}\right\} T^3$$

W. Kangro Z. ph. Ch. 87 p. 257 (1914)

D. Tyndallphänom. in Flüssigkeiten

Fillen gab schöne Resultate, z. B. 40 cm³ 0.38 äquiv. norm. $ZnSO_4$ und NaOH Lösung in 1/2 äquiv. N

Distillation ... Result. n

F. C. Brown. Phys. Rev. 4, 85, 1914

The Crystall Forms of Selenium and some of their physic properties

Formed by sublimation at about 270° in glass tube, in vacuo or air

very transparent till 0.2 mm, sensitive to light, and to pressure.

Nature 93 p. 481. 1914

Kamerlingh Onnes lead coil 1.80 no decrease of magnetic moment till 4.26°
normal resistance 734 Ω immediate fall off at 6° K

decrease less than 1% per hour

(resistance of order 2.10¹⁰ normal)

p. 480 Nutting: ~~retina fully adapted to darkness is~~
image on retina just visible after partial adaptation to darkness
would produce an image on photographic plate after exposure of
one hour

Retina fully adapted to darkness is still 1000 times more sensitive!

W H Bragg X Rays & Crystalline Structure Nature 93 p. 494, 1914

Extremely interesting (!) resumé of recent work

his son W L Bragg theory of reflection by successive equidistant planes (Zeeman also!)

(2. Rayleigh reflection of sound by equidistant ~~[illegible]~~ muslin sheets stretched on frames

double power:

1). structure of crystals → f. ex. structure of diamond tetrahedr. every atom = centre of tetrah. composed by its 4 nearest neighbours.

2). wave lengths of X.

All substances of atom weight 27 – 108 ~~30~~ – 120

Mostly! composition strict

give two „lines"

Rhodium	0·61	0·54, 10^{8}
Pd	0·58	0·51
Ni	1·66	1·50

wave lengths decreasing with increasing atomic weight

associated with natural numbers

number of electrons :

J J Thomson Physical Society 20/6 1914 (Nature p 523)

production of very soft X Rays

till now: atom contains two separate rings of electrons

one within the other : K radiation

L radiation } much softer

J J Th. shows that there is a still much softer radiation

stopped by finest collodion film, intermediate between Schumann and ordinary X Rays

corresponding to third ring

quality depending only on ~~energy~~ velocity of moving particles not on their energy!

therefore should be produced also by cathode particle if as slow as positive rays.

M. Laue } Jahrb. f. Radioaktiv. 3 Heft 1914
W L Bragg }

Van den Broek Nature 93 p 376, 1914

Nicholson } Nature 93 268 1914 ~~[illegible]~~ explains rings impossible
Phil Mag April 1914

Cl. Schaefer Verh. D. Ph. G. 1912 p. 935 Die Trägh. d. gr. Elektron
Mittel: $\left(\frac{e}{m} = 1.766 \cdot 10^{7}\right)$

endgültige Ent. der Beweis an Einstein Lorentz gegen Abraham

Phys. Rev. 2, 58, 1913 Trowbridge A. Thermal conductivity of air at low pressures from 0.2 down to 0.01 mm; confirmation of „Smoluchowski" theory

2, 329, 1913 I. Langmuir The vapor pressure of metallic tungsten

Supp. rate of evaporation in high vacuum independent of presence of vapor, therefore identical with rate of evaporation in vacuum. Rate of condensation = rate at which it comes into contact with the wall

mass striking against wall $m = \frac{1}{4}\rho\Omega$ $\quad p = \frac{\pi}{8}\rho\Omega^2$

$$m = \sqrt{\frac{M}{2\pi R\theta}} \cdot p$$

rate of evaporation ↑ ↓ vapor press.

if a certain proportion of atoms reflected from surface then p greater in proportion.

rate of evapor. from 2440° abs – 3136 increased in the ratio of 1 : 15,000

vapor press. 10^{-7} mm $\quad 0.002$ mm (calculated after thermod. formula)

$$\log m = \log p + \frac{1}{2}\log\frac{M}{2\pi R} - \frac{1}{2}\log T$$

$$= A - \frac{0.2180\lambda_0}{T} - 0.9\log T$$

Niels Bjerrum V. D Ph G. 1914 p 640

Ultrarote Spektren, direkte Messung von Energiequanten

HCl Bande bei 3.5μ (nach Eva v. Bahr Ver DPhG 15, 1150, 1913)   J = Trägheitsmoment

Rotationsfrequenzen der HCl Moleküle

beob.	n	ber.
$0.745 \cdot 10^{12}$	1	$0.6 \cdot 10^{-12}$
1.395	2	1.2
2.015	3	1.8
2.62	4	2.4
3.20	5	3.0
3.68	6	3.6
4.08	7	4.2

$\frac{1}{2} J (2\pi\nu)^2 = n \cdot h \nu$ n = ganze Zahl

$h = 6.4 \cdot 10^{-27}$

$\nu = n \frac{h}{2\pi^2 J}$

Bei gewöhnlicher Temperatur:

Rotationsenergie:

$E = \frac{RT}{N} = \frac{1}{2} J (2\pi\nu)^2$

$\therefore J = \frac{RT}{N\, 4\pi^2 \nu^2}$

häufigste Rotationsfrequenz bei gewöhnl.
Maxim. d. Bande ~~840μ~~ 3.55μ

$\therefore \nu = 1.87 \cdot 10^{12}$

damit berechnet: $J = 0.54 \cdot 10^{-39}$

gegen Nernst V DPhG. 15, 451, 1913
Eucken " 1159 "

Goldhammer V D Ph G. ~~14~~, 707, 1914   Quantentheorie u. molek. Struktur

---

J. Franck u. G. Hertz   Erregung d. Quecksilber Resonanzlinie 253.6μμ durch Elektronenstöße

V D Ph G. 1914   p 512 [illegible] p 457

[illegible] = 4.9 Volt, [illegible] 253.6μμ

[illegible] 1 Quantum [illegible] 253.6μμ ([illegible])

Rubens u. H. v. Wartenberg   Beitrag zur Kenntnis d. langwelligen Reststrahlen

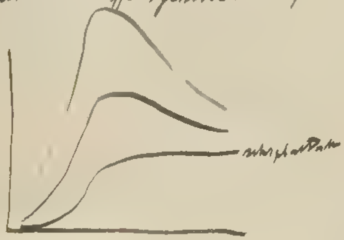
Berl Ber 1914, 169

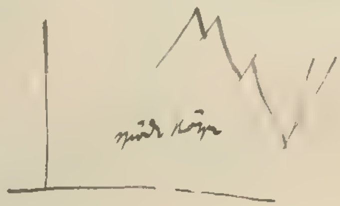
verschiedene Salze (gefunden) bis ca. 80μ

N. S. Kurnakow u. S. F. Žemčužny J. f. R. u. El. 11, 1, 1914

Fließdruck u. Härte plastischer Körper

constante Ausflussgeschwind.; dabei Druckmessung





Fließdruck = f [Ausflussgeschw., Temperatur]

wächst mit ↑, aber nicht proportional

bei Erniedrig. d. Temp. oder Erhöhung d. Ausflussgeschw. verhalten sich alle Körper spröd

Berechnet Relaxationszeit aus Kurvenstück

Aus Maxwells Theorie folgt: $F_c = E T v$

Bei Konstant. Ausflussgeschw. verhalten sich die stationären Fließdrucke wie die Koeff. d. inneren Reibung

Verf. hält also Fließdruck, innere Reibg., und Härte (Kugelprobe) für ungefähr gleichwertige Begriffe

Übertrifft die Deformat. geschw. die Relaxationsgeschw., so tritt auch ein Sprödigkeit

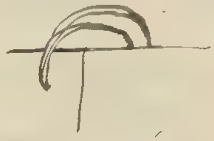
ist also Abhängig. von Relaxation mit T

Allerdings stimmt das nicht, dass F_c langsamer wächst als v

Rest sind Tabellen und ~~Theorie~~ Resultate über Mischungen und feste Lösungen.

Rutherford, Robinson ~~Rawlinson~~ Analysis of β Rays from Radium B, ~~Ra~~ Ra C

Phil. Mag. 26, 717, 1913

velocities measured by arrangement 

$\frac{e}{m_0} = 1{'}772 . 10^7$

Rays from Ra C show β from 0'9858 – 0'632 in 48 groups

Total Energy calculated by Lorentz-Einstein formula $E = \frac{m_0}{e} c^2 \left[\frac{1}{\sqrt{1-\beta^2}} - 1\right] e$

$25{'}25 . 10^{13} e - 14{'}9 . 10^{13} e$

for the ~~first~~ faster rays ~~are~~ this energy is exact multiple of

$\varepsilon = \underline{0{'}4284 . 10^{13} e}$!

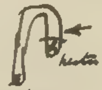
from $E = 59\varepsilon$ till $E = 24\varepsilon$

[illegible] Deutung

F. S. Phillips Phosphorescence of Mercury Vapour after Removal of the Exciting Light

Pr. R. S. 89, 39, 1913

stream of vapour excited by a mercury lamp

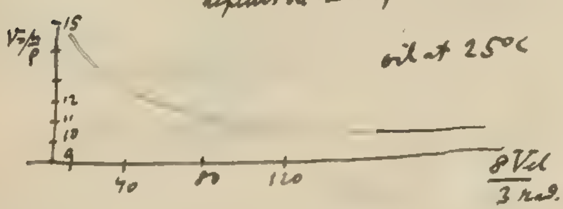
in quartz tube 

Kaye and Ewen Sublimation of Metals at low pressure Pr. R. S. 89, 58, 1913.

Davidson & F. Pr. R. S. 89, 91, 1913, Experiments on the Flow of Viscous Fluids through Orifices

Important result: viscosity, when measured by Poiseuille's method, (tube 10 cm lg, 2 mm diam.) depends on rate of distortion

Vol = 220 cm³



~~Rutherford~~

Rayleigh Scientific Papers V p. 256 Nature 72, 318, 1905

The problem of random walk (suggested in Nature LXXII p. 294 by K. Pearson)

the same as Phil Mag. 10, 73, 1880; 47, 246, 1899). If n very great $\frac{2}{n} e^{-\frac{r^2}{n}} r\,dr$

Rayleigh Sc. Pap. V p. 246 It is easy to recognise that the coupling or the severance of a pair of particles cannot occur of itself, but requires always the cooperation of a third particle!

p. 238 On the pressure of gases and the equation of virial Phil Mag. 9, 493, 1905.

F. Weckheimer Zerstreuung d. Lichts in trüben Medien Phys. Z. 13, 1106, 1912

Schwefelnebel mit einheitl. grossen Teilchen 0·002 mm Ø

Vergleich mit Rayleigh's Theorie Pr. R.S. 84, 5, 1911 (annähernd Übereinst.)

A. Bethe & Th. Toropoff Ü. elektrolyt. Vorgänge an Diaphragmen

Z. ph. Ch. 88, 686, 1914

Elektroosmose!

F. Paschen Absorption u. Resonanz monochromatischer Strahlg.

Ann. d. Ph. 45, 625, 1914

Helium absorbiert Strahlg. von 10830 u. 20582 ÅE und zeigt Resonanz für 10830,

aber nur wenn durch schwachen Strom erregt; Emission erst bei viel stärkeren Strömen

Energie der Hauptlinie 10830 steht auch auf Energie d. Satelliten

Sämmtliche absorbierte Energie setzt sich in Resonanzstrahlg. um

A. Eucken Ü. d. Quanteneffekt bei einatomigen Gasen u. Flüssigkeiten

Berl. Ber. 1914, 682

J. Stark Ph Z. 13, 585, 1912

Ü. elektrische u. mechanische Schubflächen in Metallen

Theorie einer Metallstruktur, ausgehend von Elektronentheorie

A Eucken Ü d. Wärmeleitungsvermögen, die sp. W. u. d. inn. Reib. d. Gase

Ph Z. 14, 324, 1913

$k = K c_v \mu$

Für translat. Energie soll vollkomm. Energie-Austausch stattfinden, daher

K = 2·5 (wobei sich auf Chapman beruft, dass dies unabhängig vom Kraftgesetz)

für rotatorische En. nimmt er an K = 1

für Schwingungsenergie zwischen 1 und 0·5

Messungsergebnisse für Anzahl von Gasen ergeben annähernd Übereinstimmung, allerdings

meist etwas kleinere Werte von K; also

M. He K = 2·40 | 273° woraus er schliesst, dass d. Energieaustausch d. Translat. Energie unvollständig sei (?!)

K = 2·23 | 81·5°

K = 2·02 | θ = 21°

Ar K = 2·49

Abweichung d. Molekularanordnung von gasförmigen Nd

Dies kommt auch Dimensionen d. Molek. nach Chapman-Jeans

H_2		beob.	ber.
	θ = 873	1·965	1·93
	θ = 495	2·09	2·01
	= 81·5	2·25	2·50
	= 21·0	2·37	2·50

) !! Nachwirkung ?

↑ als einatomiges Gas

Bei manchen Gasen interpretiert Verf. die Sache als Beweis für unvollst. Austausch, bei anderen für Abnahme d. spez. Wärme

Quanten und Gase

H. Tetrode Ph Z. 14, 212, 1913 Bemerkungen z. d. Energieinhalt einatomiger Gase u. ü. d.

Quantentheorie f. Flüssigkeiten

Ann 38, 434, 39, 255, 1912

Sackur Ann 40, 78, 1913

Stern Ph Z 14, 629, 1913

~~Kee~~ Keesom Ph Z. 14, 665, 1913 Z. Th. d. idealen einatomigen Gase u. d. Quantentheorie

sp. Wärme d. H_2

Einstein u. Stern Ann 40, 551, 1913

Ehrenfest Verh. D. ph. G. 1913, 451

Feste Körper:

Born u. Karman Ph. Z. 13, 297, 1912; ~~Ph~~ 14, 65, 1913 ~~Diamant [illegible]~~ ‖ Toeplitz Math. Ann. 70, 351, 1911

Debye Ann. 39, 789, 1912

(Born Ann. 44, 605, 1914 Diamant)

(R. Ortvay D. Ph. G. 15, 773, 1913

Thirring Ph. Z. 14, 867, 1913

nach v. Karman Integral für $n(\nu)\,d\nu$ bestimmt. Normalschwingungen:

$n(\nu)\,d\nu = NL\,\frac{d\varphi}{2\pi}$ wenn $\nu = \nu_0 \sin\frac{\varphi}{2}$ gesetzt wird; [illegible] Energie $f(\nu) = \dfrac{\frac{R}{N}\beta\nu}{e^{\frac{\beta\nu}{T}}-1}$ [illegible]

für eindim. (Zuggitter) $E = \dfrac{R\beta\nu_0}{2\pi}\displaystyle\int_0^{2\pi} \frac{\sin\frac{\varphi}{2}\,d\varphi}{e^{\frac{\beta\nu_0}{T}\sin\frac{\varphi}{2}}-1}$

für dreidim. $E = 3R\left(\frac{1}{2\pi}\right)^3 \displaystyle\int_0^{2\pi} \frac{\beta\nu_0 \sin\frac{\omega}{2}}{e^{\frac{\beta\nu_0}{T}\sin\frac{\omega}{2}}-1}\,\omega^2\,d\omega$

Flüssigkeiten:

Madelung kinet. Th. d. Spannungen v. Eötvös Ph. Z. 14, 729, 1913

Born u. Courant Zur Th. d. " " " 731 "

A. Rosenthal Aufbau d. Gastheorie mit Hilfe d. Quasiergodenhypothese

Ann. 43, 894, 1914

Nichtexistenz ergodischer Gase: Rosenthal Ann 42, 796, 1913

Plancherel " 1061 "

beweist auf Grund d. Quasiergodenhyp. d. Grundannahmen d. statist. Mechanik in einfacher Weise.

A. D. Fokker D. mittl. Energie rotierender elektrischer Dipole im Strahlungsfeld

Ann 43, 810, 1914

q = Parameter $f(q)$ = Geschw. der Abnahme von q wenn „sich selbst überlassen"

τ = kleines Zeitintervall R = Änderung von q in diesem Intervall infolge unregelmäßiger Einwirkung

Stationarität verlangt:

$$W(q)\, f(q)\, \tau - W(q)\, \bar{R} + \frac{1}{2} \frac{\partial}{\partial q}\left\{ W(q) \cdot \overline{R^2} \right\} = 0$$

$$\frac{\partial W}{\partial q} \cdot \frac{\overline{R^2}}{2} + W(q) \left\{ f(q) \cdot \tau - \bar{R} + \frac{1}{2} \frac{\partial}{\partial q}\left(\overline{R^2}\right) \right\} = 0$$

findet natürlich Rayleigh-Jeans Formel

C W Oseen. Ü. Möglichkeit ungedämpfter Schwingungen nach d. H. Lorentz-Theorie u. d. Planck'schen Lq theorie

Ann. 43, 639, 1914

Laue Die Freiheitsgrade von Strahlenbündeln Ann. 44, 1197, 1914

Ch. Füchtbauer & W. Hofmann: Maximalintensität, Dämpfung u. wahre Intensitätsverteilung von Serienlinien in Absorption Ann. 43, 98, 1914.

Bestätig. d. Lorentz'schen Theorie d. Stossdämpfung

Zahl d. absorbierenden Elektronen = Zahl d. Atome

Rayleigh Sound p. 152

compress.

$$s : s_0 = -\frac{\pi T}{\lambda^2 r} e^{-ikr}\left(\frac{\Delta m}{m} + \frac{\Delta\sigma}{\sigma}\mu\right)$$

m = constant of compressibility

σ = density

$\mu = \cos \angle x r$

p. 284 If direct wave: $\phi = \cos k(at + x)$

$$\psi = -\frac{\pi T}{\lambda^2 r}\left\{\frac{m'-m}{m'} + 3\frac{\sigma'-\sigma}{\sigma+2\sigma'}\mu\right\}\cos k(at - r)$$

s_0 = condensation of the primary wave at the place of disturbance

s = ... at a distance r

~~flux of energy~~ $\cancel{\frac{1}{2}\rho_0 a \left(\frac{2\pi}{\lambda}\right)^2 A^2}$

$$\frac{10\cdot(0.5)^3\frac{\pi}{6}10^{-3}}{1000} = \frac{2}{3}10^{-6}$$

A. Westgren Z. ph. Ch. 83, 151, 1913

Hg:

Teilchenzahl pro $1000\mu^3$	Diameter = $53\mu\mu$: ρ/ρ_0	69 $\mu\mu$: N	ρ/ρ_0	137 $\mu\mu$: N	ρ/ρ_0	190: N	ρ/ρ_0
35.3	0.698	13.1	0.799	4.1	0.842	3.0	0.665
23.5	0.795	8.7	0.861	2.7	0.922	1.5	0.856
17.7	0.856	6.6	0.891	2.1	0.896		
8.8	0.924	3.3	0.966	1.7	0.966		
3.5	0.989	1.3	0.998	1.0	1.017		

S $\rho = 2.0$

D = $140\mu\mu$: N	ρ/ρ_0	164: N	ρ/ρ_0	278: N	ρ/ρ_0	358: N	ρ/ρ_0
26.2	0.614	22.5	0.571	4.9	0.730	2.7	0.751
17.5	0.715	15.0	0.689	3.3	0.876	1.9	0.891
13.1	0.801	11.3	0.782	1.6	0.944		
6.6	0.907	4.5	0.879				

Se $\rho = 4.27$

D = 107: N	ρ/ρ_0	D = $132\mu\mu$: N	ρ/ρ_0	181: N	ρ/ρ_0	242: N	ρ/ρ_0
29.5	0.759	30.2	0.548	6.1	0.726	2.5	0.768
22.1	0.789	20.1	0.681	3.1	0.875	1.3	0.895
14.8	0.836	15.1	0.708	1.5	0.948		
9.8	0.885	10.1	0.746				
4.8	0.937	7.6	0.832				
		6.0	0.854				
		3.0	0.936				

Ricinusöl $\rho = 0{\cdot}96$ $D = 316\,\mu\mu$		Wollfett $\rho = 0{\cdot}89$ $D = 212\,\mu\mu$	
5·7	$\beta/\beta_0 = 0{\cdot}827$	24·4	0·591
2·9	0·873	18·3	0·694
1·4	0·932	12·2	0·802
		6·1	0·916

$$\beta/\beta_0 = 1 - \text{const.}\cdot c\, d^2 \sqrt[3]{\rho} \qquad c = \text{Konzentration}$$

$$\frac{\beta}{\beta_0} = \frac{R\vartheta}{v^2\left(\frac{R\vartheta}{(v-b)^2} - \frac{2a}{v^3}\right)}$$

Für Ricinusöl bei $\beta/\beta_0 = 0{\cdot}827$:

4 facher eingenommener Volumteil: ist $= \dfrac{4\cdot\frac{4}{3}\left(\frac{0{\cdot}316}{2}\right)^3 \pi \cdot 5{\cdot}7}{1000} = \dfrac{3{\cdot}8\cdot\pi\cdot 0{\cdot}032}{1000}$

$$= \frac{0{\cdot}38}{1000} = 0{\cdot}038\ \%$$

Svedberg Existenz p. 194

$$\frac{\frac{4}{3}\pi(0{\cdot}2)^3}{1000} = \frac{4}{3}\pi\cdot 8\cdot 10^{-6} = 3{\cdot}5\cdot 10^{-5}$$

Gummigutt $D = 400\,\mu\mu = 0{\cdot}4\,\mu$		$D = 190$	
$N = 10$	$\beta/\beta_0 = 0{\cdot}406$	$N = 73{\cdot}5$	0·522
5	666	36·7	0·555
2·5	761	7·3	0·776
1	863	1·5	0·922

Also sind bei ~~Westgren~~ Svedberg die Abweichungen für $(a = 0{\cdot}2\,\mu)$ schon sehr bedeutend bei einer Konzentration von $\frac{1 \text{ Teilchen}}{1000\,\mu^3}$, was einer Volum Konzentr. von $3{\cdot}5\cdot 10^{-5}$ entspricht! während Perrin-Constantin noch bis $c = 0{\cdot}01$ vollständige Übereinstimmung mit [illegible] findet.

K. Seelis   Messung d. Avogadro'schen Kst. als Funktion d. inneren Reibg

Z phys Ch. 86, 682, 1914

Zinnober in H_2O – Glyzerin gemischen von reinem H_2O bis 75%

$\eta = 9{\cdot}00 \cdot 10^{-3} \ldots\ldots 162 \cdot 10^{-3}$

Resultate: Verteilungsformel in der Ebene bestätigt

Abhängigkeit von η scheint für mittl. Konz. mehr als zufällige Abweichg aufzuweisen (?); im Allg. Übereinstimmg

Avogadrokonst. etwa $\frac{1}{2}$ von der unter Voraussetzg von Kugelgestalt berechneten.   Sonst lauter Stiefel!

Schluss: Verwende nicht Zinnober zu solchen Messungen, weil das undefinierbare Aggregate und keine Kugeln sind!

A. Westgren   Arkiv f. Mat. Kem.   9 No 5 (1913)

× Kinet. Energie d. Emulsionsteilchen.

Vertikal. Verteilg an Selen & Gold Emulsionen, Verteilg sehr annähernd exponentiell, obwohl nach früheren Resultaten grosse Abweichungen zu erwarten gewesen wären.

Avogadro'sche Zahl würde sich in verschiedenen Viscosit. verschieden ergeben..

Putnoky Lad. v.   × Potential [illegible]   Z f Elchem 19, 920, 1913

[illegible] elektrische [illegible]

Mc Taggart   Ph. Mag 27, 297, 1914

A Westgren Z. ph. Ch. 89, 63, 1914 Prüfung d. Diff., d. Fallgeschw. u. d. Sedimentationsgleichgewichts d. Teilchen in Se u. Au Hydrosolen

Sammelt die Teilchen durch Zentrifugieren an einer Wand und beobachtet dann das langsame Wegdiffundieren derselben

Berechnung unter Annahme d. Formel: $n = k e^{-\frac{x^2}{2\overline{\Delta x^2}}}$ $\overline{\Delta x^2} = 2Dt = $ [illegible]

A. Schidlof & A. Karpowicz [illegible]

Ph. Z. 16 p. 42, 1915

[illegible] $a = 15 \cdot 10^{-5}$ cm Falldauer über 0'285 cm: 6'5 sek.
nach 27 Min 10'7 sek.

[illegible]

Rutherford Phil Mag 27 p. 488 (1914) Structure of the Atom

Brillouin Ann. ch. ph. N nombre de grains arrêtés par la paroi

$$N = \frac{n\xi}{2} \qquad \xi = \sqrt{2Dt}$$

$$= n\sqrt{\frac{Dt}{2}}$$

Donc par unité de temps: $\frac{dN}{dt} = \frac{1}{2} n \sqrt{\frac{D}{2t}}$

Jeans Phil Mag 20 p 9... 1910

Non Newtonian Mechanical Systems and Planck's Theory of Radiation

Energy 0 ε 2ε ....

probabilities ratio: $1 : e^{-2h\varepsilon} : e^{-4h\varepsilon} : \ldots$ $h = \frac{1}{2R\theta}$

N vibrations: $N = M(1 + e^{-2h\varepsilon} + e^{-4h\varepsilon} + \ldots) = \frac{M}{1-e^{-2h\varepsilon}}$

$$E = M(\varepsilon e^{-2h\varepsilon} + 2\varepsilon e^{-4h\varepsilon} + \ldots) = \frac{M\varepsilon e^{-2h\varepsilon}}{(1-e^{-2h\varepsilon})^2} = \frac{N\varepsilon}{e^{2h\varepsilon}-1} \qquad \varepsilon = h\nu$$

At wave-length λ_{max}, $\frac{\varepsilon}{R\theta} = 4.965$ so that only one wave length in 140 possesses any energy.

$\frac{\lambda_{max}}{2}$ " 20,000 "

K. Scheel & W. Heuse Sp. W. v. Helium u. einig. 2atomig. Gase Ann. 40, 473, 1913

	θ	c_p	$C_{v_0} = const$	κ_0	Luft	
H_2	+16	3.403	4.875	1.407	+20	κ = 1.400
	−76	3.157	4.379	1.453	−76	1.396
	−181	2.644	3.335	1.595	−181	1.408

He	+18	κ = 1.660	N_2	t = 20	κ = 1.398	CO	κ = 1.396
	−180	1.673		−181	1.419		1.417

W. J. van der Bijl Verh. D. Ph. G. 1913

Zn λ = 254 μμ ausgelöste Elektronen 2.2 Volt

Millikan Ph. Rev. 4 p 73, 1914, cf Richardson p. 522

$Pd.e = \frac{1}{2}mv^2 = h\nu - P$ very accurately $\frac{h}{e} = 4.123 \cdot 10^{-15} \frac{\text{Volt}}{\text{Frequenz}}$ (error ½ % !)

$\therefore h = 6.561 \cdot 10^{-27}$

(Riecke Ph. Z. 16, 222, 1915) also gutes Referat.

Bohr Phil. Mag. 26, p. 1   1913

radius   frequency of revolution

$\cancel{m\omega^2 2a = \frac{eE}{(2a)^2}}$ $W = \frac{eE}{2a}$ $4\pi^2 \cdot 2a \cdot \omega^2 = \frac{eE}{(2a)^2}$

$\cancel{m\omega^2 \cdot 2a = \frac{eE}{(2a)^2}}$ $\cancel{W\omega^2 = \frac{W^3}{(eE)^2}}$

$$\therefore \quad m \cdot 4\pi^2\omega^2 = \frac{W^3}{(eE)^2}$$

$$2\omega = \frac{W^{3/2}}{\pi eE\sqrt{m}}$$

Bohr: $\omega = \frac{\sqrt{2}}{\pi}\frac{W^{3/2}}{eE\sqrt{m}}$, $2a = \frac{eE}{W}$ $e = E$

τ = integer number

$W = \tau h \frac{\omega}{2}$ suppos.: $\nu = \frac{\omega}{2}$ = frequency of vibr. emitted during binding of electron (at first being at rest)

$$W = \frac{2\pi^2 m e^2 E^2}{\tau^2 h^2} \qquad \omega = \frac{4\pi^2 m e^2 E^2}{\tau^3 h^3} \qquad 2a = \frac{\tau^2 h^2}{2\pi^2 m e E}$$

Different values of τ give series of values for W, ω, a stationary states without radiation

Greatest value W, = stablest state for $\tau = 1$

$2a = 1{\cdot}1 \cdot 10^{-8}$ cm $\omega = 6{\cdot}2 \cdot 10^{15}$ $\frac{W}{e} = 13$ Volt

Energy emitted by passing from τ_1 to τ_2:

$$W_{\tau_2} - W_{\tau_1} = \frac{2\pi^2 m e^4}{h^2}\left(\frac{1}{\tau_2^2} - \frac{1}{\tau_1^2}\right) = h\nu$$ ((why not multiple ?)

$$\therefore \quad \nu = \underbrace{\frac{2\pi^2 m e^4}{h^3}}_{3{\cdot}1 \cdot 10^{15}}\left(\frac{1}{\tau_2^2} - \frac{1}{\tau_1^2}\right)$$

observed value for Balmer series = $3{\cdot}29 \cdot 10^{15}$

Diameter of orbit $\sim \tau^2$

for $\tau = 12$ $a = 1{\cdot}6 \cdot 10^{-6}$ cm therefore higher lines not visible in ordinary gas, only celestial

necessary: small density

1, 12 (1914)

L. Brillouin Ann d Ph. Rayonnement et chaleurs spécifiques

Il n'est pas nécessaire de recourir aux formules de Planck pour les résonateurs si l'on adopte l'hypothèse

$U = \frac{4\pi}{\Omega^3} F(\nu)$ au lieu de $U = \frac{8\pi}{\omega^3} F(\nu,\theta)$ (~~Planck~~) p. 23, 37, 44 etc

pour chacun des types des ondes, en équilibre

$\therefore$ pour l'éther $U_0 = \frac{4\pi}{\omega_0^3} F(\nu)$

pour les ondes sonores $U_1 = \frac{4\pi}{\omega_1^3} F(\nu)$, $\left.\begin{matrix} U_2 \\ U_3 \end{matrix}\right\} \frac{4\pi}{\omega_2^3} F(\nu)$ — les ondes sonores ont beaucoup plus haute energie du rayonnement thermique que :

$U(\nu) = \left(\frac{1}{\omega_1^3} + \frac{2}{\omega_2^3}\right) \frac{\omega_0^3}{2} U_0(\nu,\theta)$

= formule de Debye (un peu différé)

L. Brillouin C. R. 159, 27, 1914 Conductibilité calorifique et viscosité des liquides

Extension de la théorie de Debye à l'étude de la viscosité

E. Meyer & W. Gerlach Der photoelektrische Effekt an ultramikr. Metallteilchen Ann 45, 177, 1914

Verzögerungszeit richtig erklärt als Wirkung d. Luftmolek. Versuche bei verminderten Druck werden fortgesetzt werden

Daher geschehe, 1 2 · 10 ... 10/100 ... $t_1 \dots t_2$

$\int_{t_1}^{t_2} N\mu e^{-\mu t} = N(e^{-\mu t_1} - e^{-\mu t_2})$ — E. Marsden & T. Barratt Ph. M. S. 23, 367, 1911; E. Friedmann Wien. Ber. 122, 1269, 1913

$N = 10$ ... Intervalle.

$\mu = \frac{1}{\text{Intervall}}$

S. R. Milner The Virial of a Mixture of Ions Phil Mag 23, 557 1913

The Effect of Interionic Forces on the Osmotic Pressure of Electrolytes

Phil Mag 25, 742, 1914

If no forces ~~...~~ probability for nearest ion ~~to~~ to lie in given elementary volume dv_1
second nearest - - - - - - - dv_2 etc.

$$p = e^{-\frac{2N}{V}\frac{4}{3}\pi r_m^3}\ \frac{2N}{V}dv_1\ \frac{2N}{V}dv_2 - \frac{2N}{V}dv_m$$

With interionic forces:

$$P(E) = k_m\ e^{\underbrace{-\frac{1}{w}\sum_{p=1}^{m}\sum_{i=0}^{p-1}\frac{q_i q_p}{r_{ip}}}_{=\text{pot. energy}} - \frac{2N}{V}\frac{4}{3}\pi r_m^3}\ \frac{2N}{V}dv_1\ \frac{2N}{V}dv_2 \cdots \frac{2N}{V}dv_m$$

$w = \frac{RT}{N}$ = most probable kinetic energy of ions

assumptions: any single term $\frac{q^2}{rw}$ can be considered small.

for ex.

$$\int_\varepsilon^R \frac{k\, e^{\frac{q^2}{rw}}\, 4\pi r^2 dr}{\frac{4}{3}\pi R^3} = 1 = \underbrace{\frac{3k}{R^3}\int_\varepsilon^{r_1} e^{\frac{q^2}{rw}} r^2 dr}_{\text{always can be made small in comparison to}} + \frac{3k}{R^3}\int_{r_1}^{R} e^{\frac{q^2}{rw}} r^2 dr$$

by increasing R

ε depends on size of ions
r_1 smallest value at which $\frac{q^2}{rw}$ can be considered a small quantity

Restriction to dilute electrolytes, no association (why?)

Very complicated calculation for a certain sequence of I ~~...~~ of ions, then deduction of general values

$$h = \sqrt[3]{\left(\frac{4\pi}{3}\ \frac{2N}{V}\right)}\ \frac{q^2}{w}$$

q = ionic charge

" concentration

average virial $\overline{E} = N\, w\, h\, \varphi(h)$ (repulsive forces +)

h	$\varphi(h)$
0	0
0·109	−0·42
0·3	−0·66
0·867	−1·03

$h = \dfrac{\text{pot. energy of two ions at a distance apart equal to radius of sphere in which on a random distrib. average number of ions} = 1}{w}$

on account of water ~~...~~ to be substituted:

$$h = \left(\frac{8\pi N}{3V}\right)^{1/3}\frac{q^2}{Kw}$$

Result:

$$\mathfrak{P} = \frac{2RT}{V} - \frac{1}{3}\,\frac{RT}{V}\,h\,f(h)$$

$C = \frac{\text{mol. gramm}}{\text{Liter}}$	h	$\frac{1}{3} h f(h)$
0·0001	0·0559	·0056
0·001	·120	·0175
0·002	·152	·0245
0·005	·206	·038
0·1	·259	·053
0·2	·327	·079
0·5	·443	·115
1	·559	·162
2	·704	·224

molecular lowering of freezing point $\tau = 1·86\left\{2 - \frac{1}{3} h f(h)\right\}$

good agreement with KCl (Loomis, Landolt, Ab., KNO_3 NaCl Abegg, Arrhenius) etc. NH_4Cl

Lamb – (Hydrodyn.) p. 726

Trägheit d. Kugel vermehrt $\left(\frac{1}{2} + \frac{9}{4\beta a}\right) \cdot \frac{4}{3}\pi\rho a^3$

Eff.

$$\left(\frac{1}{\beta a} + \frac{1}{\beta^2 a^2}\right) 3\pi\rho a^3 \sigma$$

$\nu = \sqrt{\frac{\mu}{\rho}} = 0·00018$ Lp

$$\beta = \sqrt{\frac{\sigma}{2\nu}}$$

Period: $\frac{2\pi}{\sigma}$

$\sigma = 2\pi n$

Boltzmann Ann. 57, 773, 1896

$1\,cm^3 \parallel n = 10^{19}$. $\bar{v} = 500 \frac{m}{sec}$ [illegible]

[illegible] Diagramm Raum in Würfel von 1 m Elementarwürfel

Annahme jed. Molek. in Sekunde $4 \cdot 10^9$ Zusammenstöße, $\therefore$ [illegible] $2 \cdot 10^{27}$ [illegible]

bei jed. [illegible] [illegible] Elem. würfel [illegible]

Anzahl aller Komb. aller [illegible] Elem. W. $= N = \frac{2\,(2\pi)^{\frac{3n-4}{2}}\, a^{3(n-1)}}{3 \cdot 5 \cdots 3(n-1)}$

[illegible] Komb. [illegible]

[illegible] Komb. [illegible] $\frac{N}{6}$ [illegible] // [illegible]

$\frac{N}{6}$ [illegible] Trillionen Stellen

Dalton

Op. [illegible] p. 33 (1886 [illegible])

„[illegible] Universum [illegible]"

H. Fletcher A determin. of Avogadro's const. N from measurements of the Br. M. of small oil drops suspended in air Ph. Rev. 4, 440, 1914

Ph. Z. 33, 81, 1911 (August 1911) ([illegible])

Millikan: $k = 1 + \frac{l}{a}\left(0.874 + 0.32\, e^{-1.54\frac{a}{l}}\right)^{-1}$ $\mu = 0.3506\, p c l$

Ph. R. 2, 109, 1913 $l = \frac{70.5}{p} + 10^{-5}\left\{1 + 0.00446(t-20)\right\}$

~~b = a~~

Oberbeck W. Ann. 7, 271

" 11, 489, 1880 [illegible]

$$\vartheta = \vartheta_0 + \alpha\vartheta_1 + \dots$$

$$u = \alpha u_1 + \alpha^2 u_2 + \dots$$

$$v =$$

$$w =$$

$$p = \alpha p_1 + \alpha^2 p_2 + \dots$$

$$\Delta\vartheta = 0$$

$$\Delta u = \frac{\partial p}{\partial x} \quad \Delta v = \frac{\partial p}{\partial y} \quad \Delta w = \frac{\partial p}{\partial z} - \beta\vartheta$$

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0 \qquad \beta = \frac{\rho_0 g}{\mu}$$

~~Zuerst~~ ϑ berechnen, dann u v w. wobei [illegible]:

$$u = \frac{\partial^2 f}{\partial x \partial z} \quad v = \frac{\partial^2 f}{\partial y \partial z} \quad w = \frac{\partial^2 f}{\partial z^2} + F \quad \Delta\left(\frac{\partial f}{\partial z}\right) = p + \text{const} \quad \Delta F = -\beta\vartheta$$

$$\frac{\partial}{\partial z}(\Delta f + F) = 0$$

[illegible]: $\Delta f = -F$

[illegible] F [illegible] ϑ [illegible] f [illegible] F [illegible]

[illegible]: $F = F_1 + F_2$ $f = f_1 + f_2 + f_3$ wobei $\Delta F_1 = -\beta\vartheta$ $\Delta F_2 = 0$

$\Delta f_1 = -F_1$; $\Delta f_2 = -F_2$; $\Delta f_3 = 0$

unter Annahme

$$\theta = \theta_0 \left\{ 1 - \kappa + \frac{z}{R} + \frac{\kappa}{2R^2}(2z^2 - x^2 - y^2) \right\} = \theta_0 \left\{ 1 - \kappa + \frac{r\cos\varphi}{R} + \frac{\kappa}{2}\frac{r^2}{R^2}(3\cos^2\varphi - 1) \right\}$$

wird

$$u = \frac{\alpha \beta \kappa \vartheta_0}{70 R^2} xz (R^2 - r^2) \qquad v = \frac{\alpha \beta \kappa \vartheta_0}{70 R^2} yz (R^2 - r^2)$$

$$w = \frac{\alpha \beta \kappa \vartheta_0}{70 R^2} (R^2 - r^2) \left[z^2 + \tfrac{1}{2}(R^2 - 3r^2) \right]$$

„Entzogene Wärmemenge" prop.: $\dfrac{\rho^4 c^2}{\lambda \mu^2}$ $\qquad \lambda$ = Leitfähigkeit $\qquad \dfrac{\partial\theta}{\partial t} = \dfrac{\lambda}{c\rho} \Delta^2\theta$

$$\rho = \rho_0 (1 - \alpha\vartheta)$$

Chevreul Examen critique de l'histoire du nitre – C.R. 69, 847 (1869)

Peinsant 1836–1840 Nouvelle description géométrique de la France Paris 1840

Bessel 1841

Pogg. Ann. 42 p. 622, 1837 Darstellung u. Ann. u. alle ... Rot Sphär. v. d. ... u. Rechnungsfehler ... astron. Nachr. Nr 333 $\quad$ 10000 565 · 278 m $\quad$ 10000 855 · 70

55 p. 529, 1842 Astr. Nachr. Nr 438 anzeigt Peinsant

A. Westgren Z. phys. Ch. 89 p. 63, 1914

p. 65 $\cancel{\Delta x}$ $\overline{\Delta}_x = \sqrt{\frac{2}{\pi}} \sqrt{\overline{\Delta_x^2}}$ wegen Brillouin Paris ... Atomes p. 185

Ann. Ch. Ph. 27, 416

statt $\overline{\Delta x} = \sqrt{\overline{\Delta_x^2}}$

Reduktion d. selenigen Säure mit Hydrazinhydrat gibt immer gleichkörnige Sole(?)

bei korrekter Rechnung würde man erhalten $44 \cdot 10^{22}$ statt $69 \cdot 10^{22}$

Wenn Probe Teilchen an Wand und dann losgelassen:

$$v = k\, e^{-\frac{x^2}{2\Delta x^2}}$$

$$D \frac{\partial^2 n}{\partial h^2} + g \frac{\partial n}{\partial h} = \frac{\partial n}{\partial t}$$

$$\therefore \frac{\lg \frac{\nu_1}{\nu_2}}{x_2^2 - x_1^2} = \frac{N f}{4 R T} \qquad f = \kappa\, \mathfrak{E}\, \delta\, e$$

O. Kruste & Wärmeleitfähigkeit d. Oxyde   Wien Ber. 122, 1923   1913

nach Christiansen Methode durch Vgl mit einer Glasplatte

gepresste Pulver: MgO, ZnO, Al_2O_3, FeO, Cr_2O_3, CuO, PbO, NiO, CdO, Co_2O_3

$k = 0{\cdot}00100$ bis $0{\cdot}00224$ (bei Dichten $d = 0{\cdot}6$ bis $1{\cdot}7$)

bezieht sich auf Smoluchowski's Versuche und meint dass diese dadurch erklärt würden.

Zeitabstand aufeinanderfolgender Emissionen

E. Marsden & T. Barratt Pr. Ph. S. 23 p 367, 1911

Exper. Prüfung:

Ph. Z. 12, 193

S. Curie, Le Radium 8, 354 1911

E. Erdmann   Wien Ber. 122 p 1269, 1913 (Bericht sich auf Marsden u. Smoluchowski)

↓ Streuung d. α Teilchen von Polonium entspricht d. Theorie von

Verteilg. d. Zeitintervalle entspricht M s B.

Bortkiewicz

Zeitabstand aufeinanderfolgender Szint.

Wahrsch. dass er $> z$ sei $= F(z)$ = Wahrsch. dass nach Eintritt eines Sz. der nächste nicht eher als nach z Zeiteinheiten stattfindet

Wenn sie aber von einander unabhängig sind, so = Wahrsch. dass in beliebigem Zeitpunkt der nächste nicht eher als nach z Zeiteinh. stattfindet

also

$$F(z+h) = F(z)\,F(h)$$

$$\therefore F(z) = e^{-kz}$$

Wahrsch. dass Zeitabstand $< z <$ ... $f(z) = -F'(z) = k e^{-kz}$

Wahrsch. dass in einem Zeit Intervall d. Länge τ sich x Szintill. ereignen =

$$w(x) = \frac{(k\tau)^x e^{-k\tau}}{x!}$$

p. 18

Diese Formel auch abgeleitet von Bateman: E. Rutherford & H. Geiger, – Bateman Ph. M. 20, 1910 p. 698

Dispersion mittlerer Wert: $E(|x_i - k\tau|) = 2\,\frac{e^{-k\tau}(k\tau)^{\mu+1}}{\mu!}$ μ ganze Zahl $k\tau-1 \leq \mu < k\tau$

$M(x_i - k\tau) = \sqrt{k\tau}$

Helmholtz Physiolog. Optik 2 Aufl. II p. 179, 180

Plateau findet Dauer d. Vorbeigangs einer Scheibe (eines schwarzen Sektors) gleichmäßige Eindruck macht: 0'191 bis 0'295 sek

Emsmann ebenso 0'22 – 0'29

Dagegen Helmholtz bei stärkstem Lampenlicht $\frac{1}{48}$ bei Vollmond $\frac{1}{20}$

Richtiger zu fragen nach der (größten) Dauer der ganzen Periode der Beleuchtungsänderung welche noch kein

Flimmern erzeugt: Helmholtz $\frac{1}{24}$. $\frac{1}{10}$ sek

Lissajous bei Beobachtung eines hellen Lichtpunktes : $\frac{1}{30}$ sek.

Schwerer ist es die Zeit zu bestimmen bis ein Licht Eindruck ganz verlöscht, bei hellem Sonnenlicht bis zu einigen Minuten

Also helles Licht wirkt anfangs am raschesten abnehmend, aber dauert im ganzen doch am längsten.

Czuber p 18

Ortland, J v Kries, Die Princ. d Wahrsch., eine log. Unters. 1886 (Kap X) dazu Meinongs Kritik Gött. Gel. Anz. 1890

C. Stumpf [illegible] Bayer. Akad. 1892

Goldschmidt [illegible] Kritik 1897 [illegible]

Ammon [illegible]

p. 8 so [illegible] Zufall [illegible] Verstandes [illegible]

Indessen [illegible] Kausalen [illegible]

Mit d. Worte Zufall [illegible] Kausal [illegible] nicht [illegible]

[illegible] Konstatierung nicht hinaus kommen

Es ist [illegible] bekannte [illegible] Ursache [illegible] Zufall

p. 9. gleichmögliche Fälle

J. Bernoulli [illegible] ... Ars conjectandi (Ostw. Klass. Nr 108 p. 88) 1713 p. 224

Laplace [illegible] Théor. anal. d. prob. 1812 p. 178

a) Prinzip d. mangelnden Grundes

b). dagegen Pr. d. zwingenden Grundes [illegible]

a). also [illegible] $\frac{1}{6}$ (mang. Gr.)

b). [illegible] (zw. Gr.): [illegible] $\frac{1}{6}$ [illegible]

[illegible] (a) $\frac{1}{2}$

(b) wird [illegible]

[illegible] objektiven [illegible]

Anwendung kommt es [illegible] Vorgang bei der Wahrscheinlichkeit an!

N. Campbell Electrical Resistance of Xylol-Alcohol Mixtures (Ph. M. 23 p.

Best proportion: 1 part alc. + 10 parts Xylol (obey Ohm's law)

specific resist. = $10^{10}\ \Omega$ Alcoh. is to be distilled from lime

Xylol used, commercial

hermetically sealed in glass

any electrodes

large temperature coefficient ~~[illegible]~~ (increases with temp.) $R_t = R_{20}\left[1 + 0{\cdot}014\,(t-20)\right]$

Ramsauer Remark on Production of Condensation Nuclei in Air --- by intense cooling (Ph. M. 23 p. 849)

in connexion with paper of S. Owen Ph. M. 1911 p. 563

By intense cooling of air (unfiltered dried) nuclei are formed consisting of CO_2, NH_3, vapours etc.

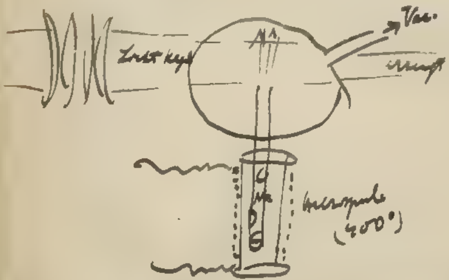
They can be removed by passing through filter (cooled). Only heating of all the walls can prevent the formation of these traces of vapours. Very pure air without such nuclei is to be got from liquid air, passing through glass tube which was previously heated to dull red heat. Glass wool no use for purifying, but is asbestos filter of combustion glass which can be cleaned by heating to dull red heat.

Dunoyer Radium 10, 400, 1913

Sur la résonance optique des gaz et des vapeurs

1). Na-dampf bei [illegible] übergang in diffuse Oberflächen Reflexion

2). Sichtbarmachung d. Na-dampf Strahles welcher von erwärmtem Na in sehr luftleer erhaltenem Gefäss ausgeht („eindimensionales" Gas) Vergl. C. R. 152, 159 (1911)



[illegible] Ph. Rev. 34 153 1911 [illegible]

[illegible]

[illegible] $V \cdot$ [illegible] 1.5

[illegible]

[illegible]

[illegible]

$V = V_0 (1 + \frac{\vartheta}{\ldots})$

[illegible]

this experiments gave $A = 1.00$

measured directly → from $a = 0.00$ [illegible]

[illegible]

[illegible] $- 1.4$ [illegible]

time of 1.00 [illegible]

Saul Dushman Theory & use of the Molecular Gauge. Ph Rev. 5, 212, 1915

Rotating disc, driven electromagnetically from outside, transmits torque by inter-effect of gas to suspended plate. Deflection read off by mirror adjustment

limit: 10^{-4} bar $= 10^{-7}$ mm Hg

Extreme sensitiveness; comparison with other gauges

Gaede's Molecular pump: for best vacuum vessel to be exhausted, connected tubing must be heated to 300° and liquid air trap inserted.

JW Woodrow Experim. on the production of & measurement of high vacua. Ph Rev. 4, 491, 1914

Angerer Ann d Ph 41, 10, 1913 like that of Trowder

lowest pressure obtained by Gaede molecular pump: 3.10^{-5} mm

charcoal + liquid air (in 36 hours) 2.10^{-7} mm.

" " and filament of tungsten (130 hours) 5.10^{-8}

H. Fletcher A Determ. of Avog. constant N from measurements of the Br. M. of small oil drops suspended in air. Ph Rev 4, 440, 1914

law of distribution of fall through constant distance

$$n = \frac{N}{2}\sqrt{\frac{h}{\pi}}\int_{t_2}^{t_1}\left(b t^{-\frac{3}{2}} + V t^{-\frac{1}{2}}\right) e^{-\frac{h}{t(b-Vt)^2}}\,dt \qquad h = \frac{9\pi\mu a k}{4 \Sigma} = \frac{3\pi\mu a k N}{2RT}$$

n = number of times out of N observations that a particle will fall a constant distance b in a time which lies between t_1 and t_2.

Let the time of fall due to gravity be: $t_g = \frac{b}{V}$

average value of times of fall below t_g:

$$\bar{t}_a = \frac{1}{2}\sqrt{\frac{h}{\pi}}\int_{t_g}^{0} t\left(b t^{-\frac{3}{2}} + V t^{-\frac{1}{2}}\right) e^{-h/t\,(b-Vt)^2}\,dt$$

Change the variable from t to u by : $b = Vt + u\sqrt{t}$

$$\bar{t}_a = 2\sqrt{\frac{h}{\pi}}\int_0^{\infty}\frac{2u^2+4bV-2u\sqrt{u^2+4bV}}{4V^2}\,e^{-hu^2}\,du = \frac{b}{V} + \frac{1}{4hV^2} + \frac{1}{V^2}\sqrt{\frac{h}{\pi}}\int_0^{\infty} u\sqrt{u^2+4bV}\,e^{-hu^2}\,du$$

Similarly average value of times of fall above t_g:

$$\overset{+}{t}_a = 2\sqrt{\frac{h}{\pi}}\int_{-\infty}^{0}\cdots\cdots = \frac{b}{V} + \frac{1}{4hV^2} - \frac{1}{V}\cdots\cdots$$

$$\frac{\bar{t}_a + \bar{t}_b}{2} = \frac{b}{V} + \frac{1}{4hV^2}$$

Theoretically this in connection with $h = \cdots\frac{N}{2T}$ could be used to determine N but the last term is so small that it is not well adapted for this purpose.

$$\tau = \frac{\bar{t}_a - \bar{t}_b}{2} = \frac{1}{V^2}\sqrt{\frac{h}{\pi}}\int_0^{\infty} u\sqrt{u^2+4bV}\,e^{-hu^2}\,du = \frac{1}{V^2h^2}\int_0^{\infty} x\sqrt{x^2+4}$$

substitute: $hu^2 = x \qquad z^2 = 4hbV$

$$\tau = \frac{2}{\sqrt{\pi}}\,\frac{t_g}{z^2}\int_0^{\infty}\sqrt{x+z^2}\,e^{-x}\,dx = \frac{t_g}{z}\,\frac{2}{\sqrt{\pi}}\left[1 + \frac{1}{2z^2}\cdots\right]$$

$$\therefore\quad z = \frac{t_g}{\tau}\,\frac{2}{\sqrt{\pi}}\left[1 + \frac{1}{2z^2} - \frac{1}{4z^4} + \frac{3}{8z^6}\cdots\right]$$

Thus: $N = \dfrac{RT}{6\pi\mu a k}\,\dfrac{z^2}{V^2 t_g}$

$$\frac{\overset{+}{t}_a + \bar{t}_a}{2} = t_g + \frac{t_g}{3z^2}$$

this only of theoret. interest, approximately (order of mag.) checked by exp.

Millikan gives $k = 1 + \frac{l}{a}\left[0.874 + 0.32\, e^{-\frac{1.54 a}{l}}\right]^{-1}$

$\mu = 0.3506\, \rho \bar{c}\, l$ 2.11

$\bar{c} = 0.921 c$

[illegible] above $a = 2.79 \cdot 10^{-5}$

t_g obtained by dividing total distance of fall by number of divisions crossed

then formed average value of all values above t_g and below t_g

$\tau = \frac{t_a - \bar{t_c}}{2}$

$V = \frac{\text{fall distance}}{t_g}$

~~about~~ ~~18.887~~ observations on 12 days

Mean value: $N = 60.0 \cdot 10^{22}$

on taking corrected values of R and μ:

$N = 60.3 \cdot 10^{22}$

(while Millikan's value $60.62 \cdot 10^{22}$)

H E Timerding Die Analyse des Zufalls Vieweg 1915 VIII + 167

p 162 [illegible] Kausalität [illegible]

[illegible] Kausalität [illegible] Kausalität [illegible]

[illegible]

[illegible]

[illegible]

[illegible] Elimination [illegible]

[illegible]

[illegible]

[illegible] Mechanismus [illegible]

Erwähnt nirgends d. Namen Poincaré. Vor Allem statistische Theorie

Mecklenburg Tyndallmetrische Messungen in einfarbigem Lichte Koll. Z. 15, 149, 1914

Darstellung des $\frac{1}{\lambda^4}$ Gesetzes an SnO_2 – Lösungen

Jeffery Stationäre Vis... von Flüssigk. Bewegg. Ph. Mag. 29, 445, 455 1915

Williams Angriff ^ Kugel in zähen Flüssigkeit 29, 526 1915

Stromlinien symmetrisch, asymmetr. ... $\sqrt{\ }$ ...

Jones Reibungselektrizität auf Isolatoren Ph. M. 29, 261, 1915

nur bestimmte maximale Elektr. ..., ... ~ ... Kapazität ...

Fabry & Buisson CR 158, 1017, 1914 } Ordnung ... Nebulium Atomgew. = 2.74 ? $\Theta = 15000°$

Nicholson 1322 } Archonium (2.95)

~~Darwin Nature 52, 413 (1895) Virial Theorem not true generally~~ ?

~~f.i. two equal bodies rotating round centre~~ Newman retracted letter

Experimental mountain building Nature 52, 459 (1895)

L. Arbenfante

Exp. of Prof. Joh. Walther – Jena india rubber balloon, covered with flour paste, dipped in flour then contracting, wrinkles = mountains

Boltzmann II p. 127

Wenn Gas von Wand umgeben: $\frac{dH}{dt} = -\frac{1}{4}\iiint \left[\lg(ff_1) - \lg(f'f_1')\right]\left[ff_1 - f'f_1'\right] g\, b\, db\, d\omega\, d\omega_1 \ldots$

.....

J. Yinbong Lee. Det. of the value of „e" by Millikan method using solid spheres. Phys. R. 4, 420, 1914

Solution of Shellac, atomised, from atmosph. pressure down to 9·65 cm; $a = 2\cdot9 - 1\cdot2 . 10^{-4}$ cm

$e = 4\cdot764 . 10^{-10}$

Finds value of $A = 1\cdot067$ (about 20% higher than Millikan) which can be explained only by assuming coefficient of slip between oil and air to be different from that between shellac and air.

Shows Rona's results to be quite unfounded.

Carl F. Eyring Det. of Ne for Hydrogen from measur. of Br. M. Phys. Rev. 5, 412, 1915

$$N = \frac{RT\, z^2}{6\pi\mu a k\, V_g^2\, t_g}$$

value of ak seems to be different for hydrogen and for air (of course!)

V_g = average velocity of fall

various oil drops

50 scale divisions

$$\tau = \frac{\overset{+}{t_a} - \overset{-}{t_a}}{2}$$

$$Xe = 6\pi\mu a k \frac{V_1 + V_2}{2}$$

$$z = \frac{2 t_g}{\sqrt{\pi}\, \tau}\left[1 + \frac{1}{2z^2} + \frac{1}{4z^4} + \frac{1}{8z^6} + \dots\right]$$

$$Ne = \frac{RT z^2}{V_g^2 t_g X} \cdot \frac{V_1 + V_2}{2}$$

F. ex. Drop 3:

plate distance 1·605 cm

Volts 1414·7

$X = 2\cdot938$

$V_1' = 0\cdot0449$ $\quad V_2' = 0\cdot0329$ $\quad V_1' + V_2' = 0\cdot0778$

$V_1'' = 0\cdot0832$ $\quad V_2'' = 0\cdot718$ $\quad V_1'' + V_2'' = 0\cdot1551$ → $V_1' + V_2' = 0\cdot0777$ per charge

length of scale division b	t_g	V_g	$\overset{+}{t_a}$	$\overset{-}{t_a}$	τ	z	Ne	No obsrv.
0·0118	1·963 (1·963)	0·00601	2·254	1·672	0·278	8·04	$2\cdot94 . 10^{14}$	1666
0·0236	3·926 (3·956)	"	4·370	3·542 (3·926)	414	10·78	2·65	831 (two divisions combined)
0·0354	5·889 (5·88)	"	63 72	5·393 (7·912)	489	13·66	2·84	550 (three
0·0472	7·852 (7·833)	"	8·389	7·277 (11·765)	556	16·00	2·92	410 (four
0·0590	9·815 (9·853)	"	10·479	9·227 (15·666) (19·706)	626	17·85	2·91	315

average of all values (with assigned weights) = $Ne = 2\cdot880 . 10^{14}$ // Ne from electrolysis $2\cdot896 . 10^{14}$

time is recorded when drop crosses each division, when full scale has been covered, drop is raised by electrostatic field and observations taken again.

Drop (1)	$t_a^+ = 2.552$ 4.245 $\frac{t_a^+ + t_a^-}{2} = 2.122$	$t_a^- = 1.693$	$t_f = 2.079$	$\frac{t^+ + t^-}{2} - t_f = 43$	(~~[illegible]~~ obs) (235)	~~[illegible]~~ 2.1 (1
(2)	$t_a^+ =$ ~~[illegible]~~ 2.220 3.751 1.875	1.531	t_f 1.863	12	(1019)	0.7 .5
(4)	4.320 7.389 3.694	3.069	3.640	54	(846)	1.5 .4
(5)	5.198 9.533 4.766	4.335	4.770	−4	(551)	−0.1 . 2
(6)	5.191 9.346 4.673	4.155	4.679	−6	(446)	−0.1 . 2
(7)	5.762 10.332 5.166	4.570	5.143	23	(379)	0.45 . 2

0.9
−0.2
−0.2
6
3.5
2.1 $\frac{3}{4}$
12.1 : 10 =
= 0.74

Arkonan's Nebel

p. 513 Ungenauigkeit d. Dropy [illegible]

Jeans Ph. M. 5 (1903) 597; Quart. journ. math. 1904, 139

[illegible] Pr. Amst. Ak. 6, 42, 1903; Versl. 1903, p. 63

Liénard J. d. Phys. 2, 677, 1903 sehr gute, aber übertriebene Kritik d. [illegible]

Dr. Hellm. Simon Göttingen Nikolausberger Weg 20

Bei unmonäm. Sofsio varinds ist die $f \circ C_s \gamma$ [illegible]

$\therefore$ $H = \int f \log f \, dx \, dy \, dz \, d\xi \, d\eta \, d\zeta$

$$\frac{dH}{dt} = \int \log f \, (f_1 f_3 - f f_2) \, V \, b \, d\omega \, d\omega \, d\omega_1 \, db \, d\varepsilon$$

Sargh. Ann-Ti, 629 Entropie

p. 627 $\quad W = \left(\frac{v}{n}\right)^n \frac{e^{n-v}}{\sqrt{2n\pi}} = \frac{\sqrt{\frac{v}{2\pi}} \, e^{-v\frac{\delta^2}{2}}}{\sqrt{1+\delta}}$

CR 158 p. 1674, 1914

<u>R. Marcelin</u> Échange de matière entre un liquide etc. ou un solide et sa vapeur saturée

Si tous les molec. de la vapeur, qui touchent la surface, se transforment en liquide

(nombre de chocs $\quad C = \sqrt{\frac{\beta}{3\pi}} \, \frac{n u}{4} = \frac{PN}{4} \sqrt{\frac{8}{\pi M R T}}$

M = masse moléculaire
P = pression
N = nombre d'Avogadro

placé dans le vide le liquide pourra evaporer au plus égal à :

$X = \frac{C}{N}$ $\quad$ et la hauteur évaporée pendant l'unité du temps :

$$V = \frac{XM}{d} = \frac{P}{4d} \sqrt{\frac{8M}{\pi R T}} = 4{\cdot}38 \cdot 10^{-5} \, \frac{P}{d} \sqrt{\frac{M}{T}}$$

Si le liquide doit être touché par λ molec. avant d'être capable d'en prendre une, la vitesse d'evaporation dans le vide sera seulement :

$v = \frac{V}{\lambda}$ $\quad$ donc on pourra calculer λ

<u>Nitrobenzene</u> $\qquad$ Naphtaline, Iode

θ =	40°	45°	50°	55°	60°	65°
λ =	15	10	7.5	6	4.8	4
$10^3 v$ (cm/sec)	1	2	4	. . . . . .		

C R 158 p 1419, 1914. (CR 154, 1912, p 577!)

Rebelin Evaporation des liquides et des solides faiblement volatiles

tube en verre très fin (0·1 – 0·3 mm diam) à parois très minces (lunette, cathétomètre

chambre de condensation où ~~[illegible]~~ passe la vapeur aspirée à tension d'équilibre

chambre de condensation { maintenue à temp. basse
{ ou solution quelconque

difficultés : 1), pureté

2). correction de poids d'évapor. (pour dét. on emploie liquide fortement volatil dont la vitesse d'évapor. dépend seulement de l'afflux de chaleur)

3). correction ~~f~~ par frottement dans le tube

observ. seulem et au sommet ; cela comporte "quelque ambiguïté"

il est impossible de mesurer des vitesses > 0·15 $\frac{mm}{min}$ pour les autres une erreur de 1 – 2% est possible

p. ex. Nitrobenzène :

$\theta =$	41	45·5	48	50·5	52·5	54	55·5	56·5	57·8	58·5
$10^3 v \left(\frac{cm}{min}\right) =$	1	2	3	4	5	6	7	8	9	10

40° pression de vapeur 0·4 mm
50° 0·9 "
60° 2 "

A. Pochettino Sur les propriétés des corps plastiques Cim 8, 77, 1914
[illegible] S E, Rech

CR 158 p 1331, 1914.

L. Brillouin Diffusion de la lumière par un corps transparent homogène

Calcul d'Einstein complété par supposition des quanta en suivant la méthode de Debije (Ann 39, 1912, 789)

pour lumière naturelle :

$$\frac{I_{diff}}{I_{incid.}} = \varphi\left[\frac{U}{\lambda}\sqrt{2(1-\alpha)}\right]\frac{1+\alpha^2}{2}\;\frac{v\left(\frac{\partial\varepsilon}{\partial v}\right)^2}{\frac{\partial^2\psi}{\partial v^2}}\left(\frac{2\pi}{\lambda}\right)^4\frac{\bar{\Phi}}{(4\pi D)^2}$$

α = cosinus de l'angle du rayon incident avec le rayon diffusé

U = vitesse du son

$$\varphi(\nu) = \frac{h\nu}{e^{\frac{h\nu}{kT}}-1} \quad \text{pour} \quad 0<\nu<\frac{U}{A_{lim}} \qquad A^3_{lim} = \frac{4\pi}{9}\frac{V}{N} \quad \text{(Debije)}$$

(Planck)

$$\varphi = 0 \quad \text{pour} \quad \nu > \frac{U}{A_{lim}}$$

∴ pour le spectre visible écarts < 1%

mais pour Rö il n'y aura d'énergie diffusée que dans un cône limité autour du rayon incident

(Einstein Ph Z 14, 317, 1913)

Sommerfeld Encyklop. II 2 5 p. 565 Hornack Z f Phys. 32 (1887) p. 91

[illegible] : L. Kelvin Math phys pap. 1 Art 11 p 39

P. Appell J. de Math 8 (1892) p. 187

[illegible]

[illegible] – Konst [illegible]

S. Ratnowsky Ableitung der Planck-Einst. Energieformel ohne Zuhilfenahme der Quantenhypothese

VDPhG. 17, 64, 1915

Annahme: Gesamtenergie besteht aus Wärmeenergie und Eigenenergie

$$U \qquad NE \qquad H$$

für Vibr.: $E = \bar{u} - \bar{\eta}$

wohlbekannte Maxwell'sche Formel: $dN = \alpha e^{-\beta\varepsilon} d\varepsilon$ (2 Freiheitsgrade)

$$\bar{u} = \frac{\int_0^\infty \varepsilon e^{-\beta\varepsilon} d\varepsilon}{\int_0^\infty e^{-\beta\varepsilon} d\varepsilon} = \frac{1}{\beta}$$

ebenso nehmen wir an: $\bar{\eta} = \dfrac{\int_0^{\varepsilon_0} \varepsilon e^{-\beta\varepsilon} d\varepsilon}{\int_0^{\varepsilon_0} e^{-\beta\varepsilon} d\varepsilon} = \dfrac{1}{\beta} - \dfrac{\varepsilon_0}{e^{\beta\varepsilon_0} - 1}$ (wo ε_0 unbekannt ist, charakteristisch für den betreffenden Körper)

~~bestimmen:~~ $\varepsilon_0 = h\nu$

$$E = \frac{\varepsilon_0}{e^{\beta\varepsilon_0} - 1}$$

Für feste Körper 3 Freiheitsgrade und ebensoviele potentielle Energie also $\bar{W} = 3N \dfrac{\varepsilon_0}{e^{\beta\varepsilon_0} - 1}$

$$= 3N \frac{h\nu}{e^{\frac{h\nu}{kT}} - 1}$$

Man kann ~~[illegible]~~ dazu auch gelangen wenn allgemeine BM Verteilung angenommen wird:

$$f = \cancel{\alpha e^{[illegible]}}\ \alpha e^{-\beta\varepsilon} e^{-\beta\eta}$$, aber für ε alle Werte von $0 - \infty$, für η $0 - \varepsilon_0$ zugelassen werden

also $\varepsilon_0 = h\nu$ = Maximalwert der Eigenenergie

A. Sie wird nicht zur Wärmeleitung beitragen; Resonatoren mit kleinem ~~[illegible]~~ η werden nicht emittieren

|| Wenn [illegible] ε_0 [illegible] temp. [illegible] Konst. [illegible] / [illegible]

Kapteyn Amsterdam Proc. 17, 139, 1914   [illegible] Salburn Bull Soc math Fr. 41, 24, 1913   415

K. Runge Math Ann 75, 130

$$f(x) = A_0 H_0(x) + A_1 H_1(x) + A_2 H_2(x) - -$$

$$A_n = \frac{1}{2^n n!} \frac{1}{\sqrt{\pi}} \int_{-\infty}^{+\infty} e^{-x^2} f(x) H_n(x)\, dx$$

expansion possible if f satisfies Dirichlets conditions

Keesom The chemical constant and the appl. of the quantum theory by the method of the natural vibrations to the equation of state of an ideal monatomic gas

Amsterdam Proc. 17, 20, 1914   Sommerfeld's [illegible] : [illegible] p. 139 to be omitted

---

Teilchen Millikan-Fletcher Phys. Rev. 32, p 394, 1911

ergibt aus [illegible] $N e = 62{\cdot}5 \cdot 10^3$ [illegible] $\pm 7\%$ [illegible] Fletcher Formel benutzt [illegible] $\overline{\lambda^2} = 1{\cdot}20 \cdot 10^6$

[illegible]

$\bar\lambda = \frac{v}{n} \sum_i \frac{\Delta t_i}{\sqrt{t_i}}$ [illegible] $\overline{\lambda^2} = \frac{\pi}{2}(\bar\lambda)^2$ [illegible] . . . gilt $\overline{\lambda^2} = 1{\cdot}24$ [illegible]

grav. | 10·3, 9·7, 6·8, 5·6, 8·3, 5·0, 7·8, 6·8, 5·7, 4·7, 7·3, 7·4, 8·6 ‖ 6·5, 6·0, 8·4, 5·6, 6·4, 6·9, 7·2, 6·5, 7·8, 8·2, 5·5

elektr | 10·6, 20·0, 13·2, 13·4, 8·8, 11·5, 16·5, 11·2, 7·2, 13·0, 13·2, 15·4, 17·0 ‖ 3·6, 2·6, 3·0, 3·6, 3·0, 3·6, 4·3, 3·3, 3·0, 3·4, 2·7

$a = 0{\cdot}00004$ cm, $b = 0{\cdot}0148$ cm.

[illegible] Fletcher's [illegible] Phys Rev. 33, 81, 1911

	$\rho =$	$N \cdot 10^{-24}$	$e \cdot 10^{10}$
No 6	3·79	205·0	1·32
9	3·47	158·6	;
1	3·90	57·0	;
3	4·09	55·0	
5	4·48	64·2	!
8	4·48	64·6	!
4	4·39	58·2	
7	4·78	69·6	
2	4·76	41·3	

$\rho = \sqrt[3]{N \cdot \frac{4}{3}\pi \rho g a^3}$

↑ aus [illegible]

[illegible]

Fletcher Ph. Zs. 12, 202, 1911

$$\sqrt{\frac{\alpha}{\pi}}\, e^{-\alpha x^2} dx \qquad (19)$$ [illegible] (17) und $\alpha = \frac{1}{2x^2} = \frac{9\pi\mu a k}{4\varepsilon t}$

$$b = Vt + x \qquad (17)$$

Dann ist unter N Wanderungen die Zahl der Fälle dass ein Teilchen die Strecke b in einer ~~Zeit~~ zwischen t und $t+dt$ durchfallen wird:

$$dn = N\,\kappa\, V t^{-1/2}\, e^{-\frac{\kappa^2}{t}(b-Vt)^2} dt \qquad (20) \quad \text{wobei} \quad \kappa = \sqrt{\frac{9\pi\mu a k}{4\varepsilon}}$$

Byerly Fourier's Series etc. (für dem Teilchen) Boston, Ginn 1893 p. 86

If plane $x=0$ impervious to heat: $$u = \frac{1}{2a\sqrt{\pi}} \int_0^\infty f(\lambda)\left[e^{-\frac{(\lambda-x)^2}{4a^2t}} + e^{-\frac{(\lambda+x)^2}{4a^2t}}\right] d\lambda$$

If $x=0$ $u = F(t)$

$$u = \frac{2}{\sqrt{\pi}} \int_{\frac{x}{2a\sqrt{t}}}^{\infty} e^{-\beta^2} F\left(t - \frac{x^2}{4a^2\beta^2}\right) d\beta$$ p. 88

If $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2} - b^2 u$

$u = f(x)$ $t=0$:

$$u = \frac{e^{-b^2t}}{\sqrt{\pi t}} \int_{-\infty}^{\infty} e^{-\frac{(\lambda-x)^2}{4a^2t}} f(\lambda)\, d\lambda = \frac{e^{-b^2t}}{\sqrt{\pi}} \int_{-\infty}^{+\infty} e^{-\beta^2} f[x + 2a\sqrt{t}\,\beta]\, d\beta$$

$$\left.\begin{array}{ll} u=0 & \text{for } x=0 \\ u=f(x) & t=0 \end{array}\right\} \quad u = \frac{e^{-b^2t}}{\sqrt{\pi}}\left[\int_{-\frac{x}{2a\sqrt{t}}}^{\infty} e^{-\beta^2} f(x+2a\sqrt{t}\,\beta)\, d\beta - \int_{\frac{x}{2a\sqrt{t}}}^{\infty} e^{-\beta^2} f(-x+2a\sqrt{t}\,\beta)\, d\beta\right]$$

$$\left.\begin{array}{ll} u = e^{-\frac{bx}{a}} & t=0 \\ u=0 & x=0 \end{array}\right\} \quad u = \frac{1}{\sqrt{\pi}}\left[e^{\frac{bx}{a}} \int_{\frac{x}{2a\sqrt{t}}}^{\infty} e^{-(b\sqrt{t}+\beta)^2} d\beta - e^{-\frac{bx}{a}} \int_{-\frac{x}{2a\sqrt{t}}}^{\infty} e^{-(b\sqrt{t}+\beta)^2} d\beta\right]$$

if $u = 1$ for $x = 0$
$u = 0$ $t = 0$ } the same as before decreased by $e^{-\frac{bx}{a}}$

if $u = F(t)$ for $x = 0$
$u = 0$ $t = 0$ } $u = \frac{2}{\sqrt{\pi}} \int_{\frac{x}{2a\sqrt{t}}}^{\infty} e^{-\beta^2 - \frac{b^2x^2}{4a^2\beta^2}} F\left(t - \frac{x^2}{4a^2\beta^2}\right) d\beta$

In this case instantaneous source of strength Q, placed at $x = \lambda$:

$$u = \frac{Q}{2a\sqrt{\pi t}} e^{-b^2 t - \frac{(\lambda - x)^2}{4a^2 t}}$$

if instantaneous doublet of strength P placed at $x = 0$:

$$u = \frac{Px}{4a^3 \sqrt{\pi} t} e^{-b^2 t - \frac{x^2}{4a^2 t}}$$

if permanent doublet of strength $f(t)$ placed at $x = 0$:

$$u = \frac{x}{4a^3 \sqrt{\pi}} \int_0^t e^{-b^2(t-\tau) - \frac{x^2}{4a^2(t-\tau)}} (t-\tau)^{-\frac{3}{2}} f(\tau)\, d\tau$$

$x < 0$ < 0

$$= \frac{1}{a^2\sqrt{\pi}} \int_{\frac{x}{2a\sqrt{t}}}^{\pm\infty} e^{-\beta^2 - \frac{x^2}{4a^2\beta^2}} f\left(t - \frac{x^2}{4a^2\beta^2}\right) d\beta$$ whence $u = \pm \frac{f(t)}{2a^2}$ for $x = 0$ (p. 96

p. 124 Instantaneous source of heat Q at the point $x = \lambda$; at origin condition $\frac{\partial u}{\partial x} = hu$ // $x = 0$

$$u = \frac{Q}{2a\sqrt{\pi t}} \left[e^{-\frac{(\lambda - x)^2}{4a^2 t}} + e^{-\frac{(\lambda + x)^2}{4a^2 t}} - 2h e^{hx} \int_x^{\infty} e^{-hx - \frac{(\lambda + x)^2}{4a^2 t}} dx \right]$$

Ann. 46, 1021, 1915 Ehrenfest's & K. Onnes Vereinfachte Ableitung d. Kombinatorischen Formel, welche d. Planck'schen Strahlungstheorie zu Grunde liegt $C_P^N = \frac{(N-1+P)!}{P!\,(N-1)!}$ [illegible] N monochrom. Resonatoren $R_1, R_2 \ldots R_N$ & Energiestufen $0, \varepsilon, 2\varepsilon, \ldots$ [illegible] Energie $P\varepsilon$ [illegible]
(2te [illegible] identische [illegible] 1, 2, .. Nte Resonator [illegible] Energiestufe ?) (Formelpolin!)
Unterschied d. Planck'schen Zählung gegenüber Einsteins Quanten [illegible]; [illegible]
Die formelle Kunstgriff Planck's kann nicht [illegible] Einstein's Quantentheorie interpretiert werden!

Stuhlmann - Zellfeld - Conrad Einfluss d. Rö Str auf d. Kondensation v. Wasserdampf Ann 46, 987, 1915
(Richarz's Theorie d. blauen Himmels!)

F. Haber u. F. Kirschbaum Z. f. Elektroch. 20, 296, 1914

Schwingender Quarzfaden-Vakuummeter

ca 2 mm dicker } Quarzfaden
7–9 cm lang }

0.5 mm f. 6″ Eigenschwingung
0.13 Oberschwingungen

Beobachtet durch Fernrohr

z.B. 0.013 mm Hg $t_{1/2} = 31$ Sek.

0.0017 180

0.00001 740

$(p\sqrt{M} + a)\,t = b$

[illegible] 1020

a, b, Const.

≈ [illegible]

bei Gemisch verschiedener Gase $(\Sigma\, p\sqrt{M} + a)\,t = b$

[illegible]

z.B. 0.003

z.B. b = 2.2

Wartenberg Dampfdruck von Na und Na_2Hg ebd. 20, 447, 1914

444°

mittels Manometer

Planck Dynamische u. statistische Gesetzmässigkeit ([illegible] 3/8 1914) Leipzig Barth 1914

Erhaltung, Formulierung d. II Hauptsatzes

Alle physik. u. chem. [illegible] [illegible shorthand]

[illegible shorthand] Temp. [illegible shorthand] Temp. [illegible]

[illegible] Temp. [illegible shorthand] II H.S. [illegible shorthand]

[illegible shorthand]

[illegible] theoretisch [illegible shorthand] Umordnung [illegible shorthand]

[illegible shorthand]

Rapports Solvay Einstein

fluctuations d'énergie d'un corps solide de capacité spéc. chaleur

$$W = a\, e^{-\frac{\varepsilon^2}{kCT^2}}$$

$$\overline{\varepsilon^2} = kCT^2 \qquad C = 3nR \frac{\left(\frac{h\nu}{k\theta}\right)^2 e^{\frac{h\nu}{k\theta}}}{\left[e^{\frac{h\nu}{k\theta}}-1\right]^2} \qquad E = 3nN \frac{h\nu}{e^{\frac{h\nu}{k\theta}}-1}$$

$\therefore$

$$\left(\frac{\overline{\varepsilon^2}}{E}\right) = \frac{h\nu}{E} + \frac{1}{3nN} = \frac{1}{Z_q} + \frac{1}{Z_f}$$

Z_q = nombre des quanta

Z_f = " " degrés de liberté

[Siehe dasselbe auf anderem Wege: Laue V. d. D. Ph. G 17, 198, 1915

$$\overline{\varepsilon^2} = kCT^2 = kT^2 \frac{dE}{dT}$$

$$\frac{1}{E^2} \frac{kT^2\, dE}{dT} = \frac{h\nu}{E} + \frac{1}{3nN} = k \frac{\partial\left(\frac{1}{E}\right)}{\partial \frac{1}{(T)}} = \frac{1}{3nN}\left[1 + \frac{h\nu}{E}\right]$$

$$d\left(\frac{1}{T}\right)\varepsilon = k \frac{d\left(\frac{1}{E}\right)}{\frac{h\nu}{E} + \frac{1}{3nN} - 1}$$

$$\frac{1}{T} = \frac{k}{h\nu} \lg\left(\frac{h\nu}{E} + \frac{1}{3nN}\right)$$

$$\frac{h\nu}{E} + \frac{1}{3nN} = e^{\frac{h\nu}{kT}}$$

$$\overline{E} = \frac{h\nu}{e^{\frac{h\nu}{kT}} - \frac{1}{3nN}} = \frac{h\nu}{e^{\frac{h\nu}{kT}} - 1}$$

partant en supposant ... au fond du vase:

$$S = \text{const} - \frac{P_2}{T}$$

$$\therefore W = C\, e^{-\frac{P_2}{kT}}$$

Siehe dagegen Wien Vorl. ü. neuere Probleme d. theor. Physik Tb 1913 p. 49–5?:

beweist dass beide Stücke anders gebaut sind ~~...~~ $\left(\frac{\varepsilon^2}{E}\right)$

und dass ~~die~~ Schwankung auf einem Spiegel infolge Strahlung

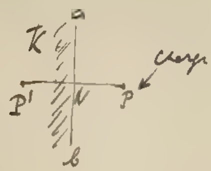
viel grösser ist als infolge der Bewegung.

erklärt dies damit dass infolge Kohärenz die Schwankungen

verschiedener Volumelemente nicht voneinander

unabhängig sind

J J Thomson Elements of math. Th of El. a. M. Art. 102



field to the right of ab can be regarded as due to e at P
e' at P'

" left " " e'' at P

$$e' = -\frac{(K-1)}{1+K}\, e$$

$$e'' = \frac{2}{1+K}\, e$$

∴ attraction of P towards plane is:

$$-\frac{ee'}{(2PN)^2} = \frac{K-1}{K+1}\,\frac{e^2}{4PN^2}$$

Planck ~~Therm~~ Thermodyn. p. 267: Charakteristische Function für unabh. Veränderl.:

$U\ V \ldots\ S$ }(Dies benutzt Planck Wärmestrahl. p. 128)

(unabh. Vol.) (unabh. Wärme ...) $T\ V$ $\quad F\ (= U - TS)$

$T\ p$ $\quad \Phi = S - \frac{U+pV}{T}$

Kann man nicht auch für F Φ direkte Wahrscheinlichkeitsbegriffe substituieren analog der Bol. Gl. $S = K \lg W$?

Letzteres für Prozesse am geeignetsten

$$\int \frac{C_p}{T}\, dT \;\Big\|\; = \frac{1}{T}\int C_p\, dT$$

Nernst Th (erweitert) $S_{T=0} = 0$ daher $S = \int_0^T \frac{C_p}{T}\, dT$

$$\therefore\ \Phi = \int_0^T \frac{C_p}{T}\, dT - \frac{1}{T}\int_0^T C_p\, dT$$ darin untere Grenze unbestimmt somit willk. Ausdruck $+\frac{b}{T}$

Folgerungen:

1). $\lim_{T=0} C_p = 0$

2). $\frac{\partial V}{\partial T} = -\frac{\partial S}{\partial p} = -\int_0^T \frac{1}{T}\underbrace{\left(\frac{\partial C_p}{\partial p}\right)_T}_{= -T\left(\frac{\partial^2 V}{\partial T^2}\right)_p} dT = \frac{\partial V}{\partial T} - \left(\frac{\partial V}{\partial T}\right)_0$

$$\therefore\ \left(\frac{\partial V}{\partial T}\right)_0 = 0$$

3). zwei Phasen $\Phi = n\varphi$ $\quad \Phi' = n'\varphi'$

Gleichgewicht: $\frac{\varphi}{n'} - \frac{\varphi}{n} = 0$

wenn schliesslich $\frac{2}{T} = \int_0^T \frac{1}{T}\,\frac{\partial r}{\partial T}\, dT$

p. 294 für ideales Gas:

$$\Phi = n\left(C_p' \lg T - R \lg p + a - \frac{b'}{T}\right) = n\varphi = n\frac{m'\varphi'}{m} = n\frac{m'}{m}\int_0^T \frac{c_p}{T}\,dT - \frac{1}{T}\int_0^T c_p\,dT + \frac{b}{T}$$

man kann bestimmen φ v. ~~...~~ φ vermittels c_1 u. φ (Kondensation an begrenzt)

Verdampfungswärme pro Dampfmolekül m':

$$r = (u+pv)' - \frac{m'}{m}(u+pv) \text{ etc.}$$

↑ (bei abs. Nullp.)

$$\therefore \lg p = \frac{C_p'}{R}\lg T - \frac{r_0}{RT} + \frac{a}{R} + \frac{m'}{mR}\left(\frac{1}{T}\int_0^T c_p\,dT - \int_0^T \frac{c_p}{T}\,dT\right)$$

für verschwindend tiefe Temp.:

$$\lg p = \frac{C_p'}{R}\lg T - \frac{r_0}{RT} + \frac{a}{R}$$

H. Tetrode D. chem. Konstante d. Gase u. d. elem. Wirkungsquantum Ann. 38, 434, 1912

Berichtigung dazu Ann. 39, 255, 1912 u. Ergänzungen

W = Anzahl aller mögl. Komplexionen $(p\,q)$ wäre ∞ wenn ohne Beschränkung = Elementargebiet

also Beschr. dass Kompl. nur dann als verschieden betrachtet wenn $p_1 \ldots p_1+\delta_1$ etc $dp_1\,dp_2 \ldots dq_n = \sigma$

Also wird d. ganze (n dimensionale) Raum pq in solche Zellen geteilt, deren Anzahl $= W_{spec}$ $\boxed{\text{also das sind wohl nicht die Boltzmann'schen Zellen!}}$

Um aber zur Entropie zu gelangen betrachtet man solche Kompl. als gleich, deren Unterschied nur in der Vertauschung gleichartigen Moleküle besteht daher

$$W_{gen} = \frac{W_{spec}}{\nu!} \quad (\text{wo } \nu = \text{Anzahl d. Molek.}) \qquad S = k \lg W_{gen}$$

$$W_{spec} = \frac{\int\cdots\int dp_1 \ldots dq_n}{\sigma} = \text{reine Zahl, daher hat } \sigma \text{ die Dimension } \sigma = \left(g\frac{cm^2}{sec}\right)^n$$

$$\therefore \sqrt[n]{\sigma} = \text{universelle Konst.: } z \cdot h \quad (z = \text{Zahlenkoeffizient, wahrscheinlich} = 1)$$

Aus Gibbs statist. mech. p. 96 etc folgt für einatomige Gas:

wenn $S = C_p' \lg T - R \lg p + a + C_p'$

$$\frac{a}{R} = \frac{3}{2}\lg(2\pi m) + \frac{5}{2}\lg\frac{R}{N} - 3\lg(zh)$$

Anwendung für Hg Dampf ~~...~~ aus Dampfdruck ergibt z nahezu gleich $z=1$, so dass allgemein

$$a = \alpha + \frac{3}{2}R\lg M$$

weiter mehratomige Gase

Valentiner Anwendung d. Quantenth. p 67

Ein (Gemisch von) zweierlei Mol. m_1, m_2 sind Elementargebiete nicht gleich zu nehmen sondern

da $m_1 \, dv_x + m_2 \, dv_x'$ constant bleibt

$$m_1^3 \, dx_1 dy_1 dz_1 \, dv_{x_1} dv_{y_1} dv_{z_1} = m_2^3 \, dx_2 dy_2 dz_2 \, dv_{x_2} dv_{y_2} dv_{z_2} = g$$

$= dx \, dy \, dz \, dx \, dy \, dz$ [illegible]

($m^{3/2}$ [illegible])

Unsinn, denn die Variabeln sind ja nicht die Koordinaten und Geschw. sondern Momente

Planck Wärmestrahl. p 131

$$a = R \lg\left[\frac{N k^{5/2}}{e\, G}(2\pi m)^{3/2}\right] \qquad G = \text{Elementargebiet} = ng$$

$g = h^3$ (Sackur, Tetrode)

O. Stern Zur kin. Th. d. Dampfdruckes einatomiger fester ~~Körper~~ Stoffe u. d. Entropiekonstante einatomiger Gase

Ph. Z. 14, 629, 1913

Modell eines festen Körpers: Punkt P, umgeben mit Anziehungssphäre, [illegible]

In der Sphäre 1 Molekül

n_0, ψ_0 Mol. dichte im freien Raum

$$n_r = n_0 \, e^{\frac{\psi_0 - \psi_r}{kT}}$$

$$m \frac{d^2x}{dt^2} = -a^2 x$$

Gesamtzahl [illegible]: $n = \int_0^R n_r \, 4\pi r^2 dr = 1 = n_0 \, e^{\frac{\psi_0}{kT}} \cdot 4\pi \int_0^R e^{-\frac{a^2 r^2/2}{kT}} r^2 dr$

$$a^2 = m(2\pi\nu)^2$$

Dampfdruck $\therefore p = n_0 kT = \frac{(a^2/2)^{3/2}}{4\pi (kT)^{1/2}} \, e^{-\frac{\psi_0}{kT}} \, \frac{1}{\int_0^{x_0} e^{-x^2} x^2 dx} \qquad \left(x^2 = \frac{a^2 r^2/2}{kT}\right)$

λ_0 = pot. Energie d. Gesamtzustand eines Mols $\Big(= L_0 + \underbrace{3N \frac{h\nu}{2}}_{\text{Nullpunktsenergie}}\Big) = \psi_0 N$

(L_0: Verdampfungswärme bei $T=0$)

wenn annähernd Grenzwert $\lim \int_0^{x_0} e^{-x^2} x^2 dx = \frac{\sqrt{\pi}}{4}$ für grosse $\frac{\lambda_0}{RT}$

$$\therefore p = \sqrt{2\pi}^3 \, \frac{m^{3/2} \nu^3}{\sqrt{kT}} \, e^{-\frac{\lambda_0}{RT}}$$

Andererseits thermodynamisch:

$$S_{\text{dampf (mol)}} = \tfrac{5}{2} R \lg T - R \lg p + R \lg R + S_0$$

$$S_{\text{fest}} = S_d - \frac{L}{T} \quad \text{etc.}$$

etc. unter Voraussetzung d. klassischen Theorie (und klassischen Resonatorenstatistik) bei Anwendung auf einen festen Körper mit Einstein'scher spez. Wärme:

$$p = \frac{1}{\sqrt{T}}\, e^{-\frac{\lambda_0}{RT}}\, R\, e^{\frac{S_0 - S_0'}{R} + \frac{1}{2}} \qquad S_0' = 3R\left[1 - \lg \frac{h\nu}{k}\right]$$

folgt $S_0 = \frac{5}{2} R + R \lg \frac{(2\pi m k)^{3/2}}{N h^3}$

also dasselbe wie Tetrode, jedoch werden Quanten explicite nicht vorausgesetzt (nur Einstein Formel)

J.H. Jeans Bericht f. 6^e Strahlungstheorie (DA) Phys. Z. 14, 1297, 1913

Schwingungsquant $\frac{h}{2\pi} = \frac{(4\pi e)^2}{c}$ (das hat schon Einstein bemerkt Phys. Z. 10, 192, 1913)

vielleicht hängt Existenz d. Elektronen damit zusammen (habe wohl, hab's mir ausgedacht!)

Verteilung auf Oszillatoren

nach Jeans und Einstein-Planck: (Solvay p. 340 d.)

$$\bar{E} = \frac{0\, e^{-\frac{0}{kT}} + \varepsilon\, e^{-\frac{\varepsilon}{kT}} + 2\varepsilon\, e^{-\frac{2\varepsilon}{kT}} + \cdots}{e^{-\frac{0}{kT}} + e^{-\frac{\varepsilon}{kT}} + e^{-\frac{2\varepsilon}{kT}} + \cdots} = \frac{\varepsilon}{e^{\frac{\varepsilon}{kT}} - 1}$$

Dagegen nach Nernst: (Solvay p. 210)

$$\bar{E} = \frac{0\left(e^{-\frac{0}{kT}} - e^{-\frac{\varepsilon}{kT}}\right) + \varepsilon\left(e^{-\frac{\varepsilon}{kT}} - e^{-\frac{2\varepsilon}{kT}}\right) + 2\varepsilon\left(e^{-\frac{2\varepsilon}{kT}} - e^{-\frac{3\varepsilon}{kT}}\right) + \cdots}{1} =$$

$$\frac{1}{1+\alpha+\alpha^2+\alpha^3 \ldots} = 1-\alpha \qquad \text{Das ist ja dasselbe!}$$

Solvay (Elektr.) p. 340

Die relative Anzahl derjenigen Oszillatoren welche $n\varepsilon$ besitzen ist nach einer oder der anderen Formel gleich: $e^{-\frac{n\varepsilon}{kT}}\left(1 - e^{-\frac{\varepsilon}{kT}}\right)$

für Diamant ($T = 73°$ abs.) $\frac{\bar{E}}{h\nu} = e^{-18.6} \doteq 10^{-8}$

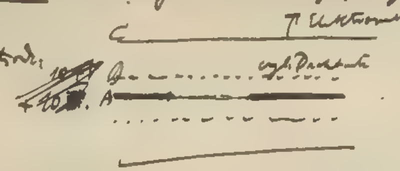
also wird auf 10^8 Atome erst ein schwingendes kommen! Schwer begreiflich!

(dagegen wohl nach Debye's Vorgang wo nicht Atome, sondern Eigenschwingungen betrachtet werden

(Anm. Sommerf.)

J. Franck u. G. Hertz Messung d. Ionisierungsspannung in verschied. Gasen Verh. d. Ph. G. 15, 34, 1913

Lenard, Rutherford, Bergen }



} verzögernde Spann.
} beschleunigende Spann.

höheres Pot. als

Aufladung d. Elektrom. erfolgt nur wenn im Raume zwischen DC Elektronen erzeugt werden, also Stossionisation eintritt

Resultate Ionisierungsspannung

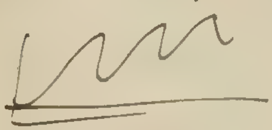
He :	20.5 Volt	H_2	11
Ne	16	O_2	9
Ar	12	N_2	7.5

Verh. Ph. G. 16, p 461, 1914 Konstante verzögernde Spann., variable beschleunigende

Solange $D < V$ Strom Null

Dann Strom entsteht bis D = Ionisierungsspannung J; dann Ionisierung am Drahtnetz oder Elektr. werden nicht anlaufen können gegen C; Strom Null bis Differenz $D - J > V$

Dann wieder Anstieg u.s.w.



Hg : $J = 4.9\,V$

$h\nu = 4.9\,V$ $\lambda = 253.6\,\mu\mu$

Also elastische Stösse d. Elektronen mit Molekülen bis zu bestimmten Geschw., dann unelastische

---

G. Tammann. Art d. Fliessens kristallisierter Körper Gött. Nachr. 1915, 49

Fliessen kristallisierter Körper rührt her von Gleitflächenbildung aber nicht von Änderung d. Schmelztemperat. infolge Druckes.

G. Tammann Abhäng. d. Kristallform v. d. Temp. d. Rekristallisation u. Konglomeraten } Nernst Festschrift p. 428

H. Schottky Veränderungen d. Blattmetallen beim Erhitzen } 1912 p. 437

Blattmetalle $\sim 10^{-5}$ [illegible] γ° ([illegible])

[illegible]

J. Meyer Zur Kenntnis d. negat. Druckes in Flüssigkt. Abhdlg. d. D. Bunsen Gesellsch. (Mk 2.10)

Debye Zerstreuung v. Rö Strahlen Gött. Nachr. 1915 p. 70

Wasserstoff Molekül = 2 Elektr. [illegible] $135 \cdot 10^{-8}$ cm [illegible] $\omega = 4{,}21 \cdot 10^{16} \frac{1}{sek}$ [illegible]

[illegible] Also [illegible] 10^{-8} [illegible] Energie [illegible] Elektr. [illegible]

Also [illegible] Bahn (e. L. Hypothese) [illegible] (der beiden Elektronen)

[illegible] Dispersion [illegible] [Die Kontraktion e H-Molekül Sitzgb. d. Dept. M. dW 9/1915]

[illegible] Störungen der Bahn [illegible] regulär [illegible]

[illegible] Energie [illegible] Elektronen

[illegible] 10^{-8} cm [illegible] Rö [illegible] Interferenz [illegible]

[illegible] regellos orientierte Anordnung v. Atomen [illegible] 1 Elektronen Ring [illegible] Elektronen [illegible]

jedes Elektron [illegible]. In grosser Entfernung:

$$E_x = -\alpha\gamma \frac{\varepsilon^2}{\mu c^2} E \frac{e^{i(\omega t - kR)}}{R} e^{ik[(\alpha-1)x_n + \beta y_n + \gamma z_n]}$$

$$E_y = -\beta\gamma \quad \cdots \quad \cdots$$

$$E_z = (1-\gamma^2) \quad \cdots\cdots$$

$\varepsilon = $ [illegible]; $\mu = $ [illegible] Elektr.; $k = \frac{\omega}{c}$

[illegible] Ampl. E [illegible]

$x_n\, y_n\, z_n$ = Koord. [illegible] $n$ten Elektrons

$\alpha\, \beta\, \gamma$ } Richtg. cosin.

Resultante $\mathfrak{E}_x = \sum_{n=1}^{p} E_x$ etc. Intensität [illegible]

(p = Elektronenzahl im Ring)

Erklärt Friedrich'sche Interferenz Ringe bei ~~[illegible]~~ amorphen Körpern u. [illegible] (Pohl p. 58)

Zerstreuung bei langen Wellen $\sim p^2$ [illegible] Verteilung [illegible] Dipol

[illegible] $\sim p$

[illegible] Elektronen [illegible] " [illegible]

Rose Univ. ... Upsala

J. Nordlund Einen Beitrag z. Avogadro'schen Konstanten Z. ph. Ch. 87, 40/1, 1914

aus d. Brown'schen Bewegg. kl. Hg Kügelchen

1) Beweglichkeit d. Emulsion?

2) Einfluss der Wände d. Kammer (Kondensor) nicht genau berechenbar!

Brauchbare Details über photograph. Aufnahme

nur Quarz, da Glas zu sehr fluoresziert!

„Ultrarapidplatten" v. Hauff (... empfindl.) Monochromat... Natrium ... entwickeln

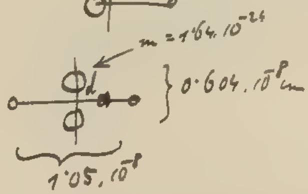
Wasser ... zur Wärmeabsorption (3 6 cm)

Alaun nützt nichts; $CuSO_4$, $Fe(NH_4)SO_4$ sind besser aber absorbieren gleichzeitig zu viel photogr. Strahlen

---

P. Debye Die Konstitution d. H-Moleküls ~~...~~ Sitzgsber. d. K. Bay. Ak. d. W. 1915, 1,

Bohr'sches Modell für Atom 

Molekül-Modell : 

$\frac{h}{2\pi}$ = Impulsmoment $= \mu a^2 \omega$

$= 1.06 \cdot 10^{-24}$

$\therefore \omega = 4.21 \cdot 10^{16} \frac{1}{\text{sek}}$

$\therefore$ Trägheitsmoment um ~~...~~ Axe in Elektronen Ebene $= 1.19 \cdot 10^{-40}$ ... in ... Quanten Effekt

an ... H_2

[ ] gilt Zentrifugal / mit Temp. ...

μ: Coulomb'sches Gesetz: $\frac{\varepsilon^2}{4d^2} = 2\frac{\varepsilon^2 d}{(a^2+d^2)^{3/2}}$

Zentrif.: $\mu a \omega^2 = 2\frac{\varepsilon^2 a}{(a^2+d^2)^{3/2}} - \frac{\varepsilon^2}{4a^2}$

$\frac{d}{a} = \frac{1}{\sqrt{3}}$

$\mu a \omega^2 = \frac{3\sqrt{3}-1}{4} \frac{\varepsilon^2}{a^2}$

Ein solches System bei jedem Wert von ω möglich

Aber hier Quantenhypoth.: $\mu a^2 \omega = \frac{h}{2\pi}$; dabei Voraussetzg dass keine Ausstrahlg stattfindet infolge normaler Bewegg d. Elektrons

Störungen werden mit genähert. Elektronenbahn berechnet, daraus d. elektr. Moment und dessen mittlerer Stärke, was eine allgemeine Disp. Formel als die Kettelersche ergibt. || 3 Eigenschwingungen:

Anm Smol. Anzahl d. Schwingungen (Umdrehungen) $n = \frac{\omega}{2\pi} = \frac{2}{3} \cdot 10^{16}$

$\omega = 2\pi n$

$\lambda = \frac{c}{n} = \frac{3 \cdot 10^{10}}{\frac{2}{3} 10^{16}} = \frac{9}{2} \cdot 10^{-6} = 0{,}045\,\mu$ also weit im Ultraviolett

$v = 2a\pi n = a\omega = 2 \cdot 10^{8} \left(\frac{cm}{sek}\right)$ $E = \frac{\mu a^2 \omega^2}{2} = \frac{h\omega}{4\pi} = \frac{1{,}06}{2} \cdot 10^{-27} \cdot 4{,}2 \cdot 10^{16} = 2 \cdot 10^{-11}$

Herzfeld Ü. d. Zusammenhang zw. d. wahrsch. u. d. mittl. Zustand in d. statist. Mechanik Ph. Z. 15, 785, 1914

Idem Beiträge z. statist. Th. d. Strahlung Wien Ber. ~~…~~, 121, 1449, 1912

K. F. Herzfeld Bemerkung zum Boltzmann'schen Prinzip Wien Ber. 122, 1553, 1913

(auch Einst. Ann 33, 1277, 1910)

Naturw. Ph. [illegible] 12, 659, 1911

$S = k \lg G + A$ (alle Zst. gleicher Energie)

bezieht sich auf Momentanzustand

für gewöhnl. Gleichgewichtszustand ist derjenige G zu setzen, welcher [illegible] entspricht (?)

[illegible]

[illegible] es muss also [illegible] thermodyn. [illegible] $\lg S = \lg$ [illegible]

[illegible]

[illegible] Gibbs $S = \lg \frac{\partial V}{\partial E}$ [illegible] $\left(\frac{\partial V}{\partial E}\right.$ = Volum [illegible] Energie [illegible]$\left.\right)$

M. Knudsen Ann. 47, 697, 1915 D. maximale Verdampfungsgeschw. v. Hg. Gegen durch feinige Luft getrübte Hg

In höchstem Grad abhängig von Reinheit d. Oberfläche

Bei fliessenden Hg Tropfen just so gross wie nach Effusionsformel, so dass jedes Molek. welches auftrifft auch verdampft.

Fr. Hauer Spontane Temp. Schwankungen in einem Gase Ann. 47, 365, 1915

$\overline{\delta^2} = \frac{kT^2}{c}$ aber Ableitung nach Einst.-Smol. nicht ganz richtig

R Gans D. F. d. ultramikroskop. Ag T. Ann 47, 270, 1915

sind Kugelförmig (aus Absorptionsmessungen)

E. Meyer u. W. Gerlach Üb. d. photoelektr. Verzög. mit d. Gasdruck v. d. ultramikrosk. Teilch.

Ann 47, 227, 1915

Verzögerung durch Gasatmosphäre verursacht aber nicht durch ~~Temp.~~ Akkumulationszeit

Jellinek Ph. Ch. p. 260

$$C = 3\frac{R}{2} + 2\frac{R}{2} + R\,\overbrace{\frac{e^{\frac{\beta\nu}{T}}\left(\frac{\beta\nu}{T}\right)^2}{\left(e^{\frac{\beta\nu}{T}}-1\right)^2}}^{\text{Schwingungsenergie}}$$ für 2 atomige Gase

nach Bjerrum ZS f Elektroch. 17, 731, 1911

für 3 atomige " " 18, 103, 1912

Rotationen: Nernst ZS f Elektroch. 17, 270, 1911 ; 17, 826, 1911

Bjerrum Nernst-Festschrift p. 95

Sackur Ann d Ph 40, 87, 1913

Jellinek Ph. Ch. d. G. p. 428

Eucken Berl. Ber. 1912, ~~411~~ 141

Jellinek Ph. Ch. d. S. p. 429:

Nernst rechnet mit Einst. Formel bei Annahme $\beta\nu = a\sqrt{T}$

$$U = \frac{R}{2}\,\frac{a\sqrt{T}}{\left(e^{\frac{a}{\sqrt{T}}}-1\right)} \qquad c = \frac{\partial U}{\partial T}$$

Dagegen Eucken konstantes ν ($\beta\nu = 430$)

und zw. kommen [illegible] Einst. F. [illegible]

[illegible] Rot. freq. [illegible]

[illegible] Rot. freq. const. [illegible] Rot. [illegible]

A. Eucken Quanteneffekt bei einatomigen Gasen u. Flüssigk. Berl. Ber. 1914, 682

bei Translatorischer Energie: Nernst ZS Elektr. 17, 826, 1911; Phys. ZS 13, 1066, 1912

Sackur Tetrode Ph. Z. 14, 212, 1913

Keesom Ph. Z 14, 665, 1913 etc.

besonders Keesoms K. O. (Vortr.) [illegible] ohne Nullpunktsenergie [illegible]

[illegible] compressibl. einatomigen Gase [illegible] Temp. (einatomig [illegible]); [illegible]

$$U = 9\frac{RT}{x^3}\int_0^x \frac{\xi^3 d\xi}{e^{\xi}-1} \quad \text{oder} \quad = 3RT\left(\frac{3}{8}x + \frac{3}{x^3}\int_0^x \frac{\xi^3 d\xi}{e^{\xi}-1}\right)$$

$\left(\frac{\Theta}{T}=x\right)$ [illegible] Nullp. [illegible]

Debye Θ variabel: $\Theta = \sqrt{\ }$ etc.

[illegible] H_2, He

[illegible] für [illegible] Konz. 36.2 [[illegible] $C_v = 35.1$] $\frac{\text{mol}}{\text{liter}}$: H_2:

$T =$	18.6	21.2	21.6	24.0	27.1	29.6	31.7	34.1	36.4
$c_v =$	2.70	2.78	2.81	3.02	3.12	3.20	3.25	3.31	3.42

[illegible] ohne Nullp. En.

< [illegible] Nullp. En.

Debye schliesst: [illegible] Quant. Th. [illegible] einatomige [illegible] Quantenfestigk. [illegible]

[illegible] Translat. En. [illegible] Co.

Light Absorption and Fluorescence Baly Phil Mag. 27, 632, 1914

Porter Formation of Images by Opaque Disk " 673

Rö-Strahlen-Spektrum Übersicht Z. [illegible] U, 28, 273, 1915

längste Rö St. [illegible] Kath Str. von 17 Volt [illegible] Quantentheorie = 745 $\mu\mu$

charakterist. Str. $\left\{ \begin{array}{l} K \\ L \end{array} \right.$ [illegible] $\left\{ \begin{array}{l} Al \\ -Ce \end{array} \right.$ 0.84 $\mu\mu$ [illegible] Moseley $\left\{ \begin{array}{l} Ag \\ Bi \end{array} \right.$ 0.056

[illegible] (Moseley 27, 1914, p 708)

[illegible] Ra B $\left\{ \begin{array}{l} 0.14 - 0.079\ \mu\mu \end{array} \right.$ Rutherf. s Anordn. ; Absorption in Al. $\frac{\mu}{\rho} = 40$ L ?

[illegible] $\frac{\mu}{\rho} = 0.19 \therefore \lambda = 0.02\ \mu\mu$ K ?

empirische Formel Siegbahn Ph Z. 16, 753, 1914 : $\left(\frac{\mu}{\rho}\right)_{Al} = A\lambda^x$

[illegible] Ra C — bis $\frac{\mu}{\rho} = 0.04 \quad \therefore \lambda = 0.01\ \mu\mu$

Sackur, Nernst Festschr. 405

[illegible] Planck [illegible]

pro Koord. [illegible]

[illegible] (pro Mol)

$$S = \frac{3}{2} kN \lg U + kN \lg v + \frac{3}{2} kN \left(1 - \lg \frac{3mN}{4\pi}\right) - kN \lg dG$$

wenn darin $\frac{\partial S}{\partial U} = \frac{1}{T}$ $U = \frac{3}{2} kNT$

$$S = \frac{3}{2} kN \lg T + kN \lg v + \frac{3}{2} kN \left(1 - \lg \frac{m}{2\pi k}\right) - kN \lg dG$$

[illegible] Thermodyn [illegible] $\underline{dG \sim N}$

Dann [illegible] Konzentration $S = N \text{ const} - kN \lg c$ [illegible]

$c = \frac{N}{v}$

Hier wird die Definition möglich [illegible] als [illegible]

Sämtliche Fälle: $g = \frac{N!}{n_1!\, n_2! \ldots n_z!} = W$

Größtmögliche Unordnung, [illegible] N [illegible]

wobei also $U = \frac{mc_1^2}{2} + \frac{mc_2^2}{2} + \ldots \frac{mc_N^2}{2}$.

Die [illegible] $W_M = N!$

$V = \frac{g}{M}$

∴ jetzt $S = \frac{3}{2}kN\lg U + kN\lg v + \frac{3}{2}kN\left(1 - \lg\frac{3mN}{4\pi}\right) - kN\lg d\sigma - kN\lg N + kN$

[illegible] ~~Thermodyn.~~ Konstante [illegible] (kN), [illegible] Thermodyn. [illegible]

Sodann Annahme (mit Sommerfeld): [illegible] $= h$

$h = dx\,(m\,d\xi)\,dy\,(m\,d\eta)\,dz\,(m\,d\zeta) = m^3\,d\sigma$

∴ $d\sigma = \frac{h^3}{m^3}$

Einatomige Gase $kN = R$ $U = 3/2\,RT$ $M = mN$ ∴

$S = \frac{3}{2}R\lg T + R\lg v + \frac{5}{2}R - \frac{3}{2}R\lg\frac{M}{2\pi R} - R\lg N - R\lg d\sigma = \frac{3}{2}R\lg T + R\lg v + S'$

Chemische Konstante $C = \frac{S' - c_p + R\lg R}{2{\cdot}3\;R}$ $c_p = \frac{5}{2}R$

$C = \cancel{\ldots} + \frac{3}{2}\lg 2\pi + \frac{5}{2}\lg R - \frac{3}{2}\lg M - \lg N - \underbrace{\lg d\sigma}$

$= 3\lg h - 3\lg m - 3\lg M - 3\lg N$

Prüfung für Neon, Argon, J

Bei mehratomigen Gasen Komplikation

$h = m\,dx\,d\xi = \ldots m\,dz\,d\zeta = m r^2\,d\varphi\,d\omega = m r^2\,d\psi\,d\omega$

∴ $h^5 = m^5 r^4\,d\sigma$

(2) $d\sigma = \frac{h^5}{m^5 r^4}$ $r = \frac{1}{2}$ [illegible] Abstand [illegible]

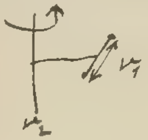
Vergleich für [illegible]

[illegible] 3atomige

N. Bjerrum Ü. d. ultraroten Absorptionsspektren d. Gase Nernst Festschr. 90 (1912)

Nach Lord Rayleigh (Phil. Mag. 24, 410, 1892) [illegible] ~~[illegible]~~ ν^2 Molekül [illegible]

2 [illegible] rotiert [illegible]



ν_1 [illegible] 2 ~~[illegible]~~ Komponenten $\parallel$ u. $\perp$ Rot. [illegible]

[illegible] $\perp$ [illegible] 2 circular [illegible] $\{\nu_1 \pm \nu_2$

[illegible] $\parallel$ [illegible] ν_1

$(\nu_1 - \nu_2) \quad \nu_1 \quad (\nu_1 + \nu_2)$

Wenn [illegible] Rotations frequenz [illegible]

[illegible] ν_2 [illegible] Nernsts Th. [illegible] diskrete [illegible]

Zwischen Möglichkeiten: 1). [illegible] Rot. Energie quantenhaft variiert

2). " [illegible] " " eines Momentabsch. "

Dagegen später Ehrenfest Verh. Ph. D. G. 15, 451, 1913; 16, 1159, 1913 [illegible]

$\nu = n \frac{h}{4\pi^2 J}$

[illegible] (1) [illegible]: $\frac{1}{2} J (2\pi\nu)^2 = nh\nu$

$$\nu = n \frac{h}{2\pi^2 J}$$

[illegible]: Wasserdampf Abs. Banden

mit Frequenz-Diff. $1.73 \cdot 10^{12}$ $\quad \lambda = \frac{3 \cdot 10^{14}}{\nu} = \frac{3 \cdot 10^{14}}{n \cdot 1.73 \cdot 10^{12}}$

(Rubens u. Aschkinass Ann. 64, 584, 1898)

n	16	15	14	13	12	11	10
ber. λ	10.8	11.6	12.4	13.3	14.4	15.8	17.3
beob. λ	10.9	11.6	12.4	13.4	14.3	15.7	17.5

[illegible]

$$\therefore \quad J = \frac{\cancel{1.73 \cdot 10^{12}} \; 6.5 \cdot 10^{-27}}{2\pi^2 \cdot 1.73 \cdot 10^{12}} = 1.92 \cdot 10^{-40} = \text{Tr. Moment} \cdot H_2 \text{ Molekül}$$

(vergl. Bohr)

[illegible] Quanten variiert

[illegible] Tr. Moment [illegible]

L. Hopf & G. Lechner Z. Messung d. mittl. Schallgeschw. in Kristallen

D. Ph. G. 16/643, 1914

Für niedrige Temp. [illegible] Debye's [illegible]:

$$C_v = \frac{16\pi^5 k^4}{5h^3}\underbrace{V_A}_{\text{Atomvolum}}\left(\frac{T}{c_m}\right)^3$$

c_m = [illegible] =

$$\frac{4\pi}{c_m^3} = \frac{1}{3}\int\left(\sum_{i=1}^{3}\frac{1}{c_i^3}\right)d\omega$$

Raumwinkelelem.

für isotrope Körper: $\frac{3}{c_m^3} = \frac{2}{c_t^3}+\frac{1}{c_l^3}$

etc. [illegible] elast. Konst. [illegible]

aber Kristalle [illegible] Integr. [illegible]! [illegible] reguläre [illegible] c_m [illegible] Elast. Konst. [illegible]

[illegible] elast. Integration, Sylvin, NaCl, NaBr, Pyrit

[illegible] elast. berechn. [illegible] > thermisch [illegible] (10 5%)

[illegible] Temp. ?

E. v. Bahr Üb. d. ultrarote Abs. d. Gase p. 710   Verh. D. Ph. G. 15 (1913)

D. Absorptionsspektrum d. H_2O dampfes p. 731

Schließt aus Absorptionsmessungen bei versch. Schichtdicken, dass im Allg. Abs. Bande [illegible]

diskontin. [illegible] Kontinuierl. werden.

Findet insbes. solche (starke) Doppelbande [illegible] CO mit [illegible] bei

t	λ_1	λ_2	$\frac{\lambda_1\lambda_2}{\lambda_1-\lambda_2}\sqrt{T}\cdot 10$
15°	4.740	4.620 μ	3.10
145°	4.750	4.605	3.08

Wenn man dies in der Art nach Bjerrum erklärt (mit Maxw. [illegible]) so müsste

$$\nu_1 \pm \alpha\sqrt{T} \qquad \frac{1}{\lambda_1} = \frac{1}{\lambda_2} + \beta\sqrt{T}$$

$$\frac{\lambda_2-\lambda_1}{\lambda_1\lambda_2} = \beta\sqrt{T} \qquad \therefore \quad \frac{\lambda_1\lambda_2}{\lambda_1-\lambda_2}\sqrt{T} = \text{const sein}$$

~~[illegible]~~

[illegible] Temp. [illegible]

[illegible] Bjerrum [illegible], H_2O [illegible] beregnet [illegible] $\nu_2 = 1.73 \cdot 10^{12}$ [illegible] 180 [illegible]

175μ [illegible]

[illegible] 12 [illegible] $\lambda_1 = 6.512$

$\lambda_2 = 5.948$

Kriterium [illegible] (Coblentz [illegible] 53, 338, 1894)

t_0	λ_1	λ_2	$\frac{\lambda_1\lambda_2}{\lambda_1-\lambda_2}\sqrt{T}\cdot 10$
17	6.512	5.948	1.17
100	6.527	5.900	1.19
600	6.563	5.607	1.14
1000	6.597	5.416	1.08
1470	6.620	5.377	1.20

[illegible] ν_1 [illegible] 6.26μ ; [illegible]

[illegible]:

$$\frac{c}{\lambda} = \nu_1 - \nu_2 = \frac{c}{6.26} - \frac{c}{\lambda_2}$$

$$\lambda_2 = \frac{-1}{\frac{1}{6.26} - \frac{1}{\lambda}} = \frac{6.26 \cdot \lambda}{6.26 - \lambda}$$

beob. [illegible]

[illegible] $\nu_1 + \nu_2$

Aus. beobacht. [illegible]:

λ	λ_2	beob. Rubens	λ_2'	λ'
6.16	385		388	6.36
6.10	240		250	6.42
6.04	172		170	6.50
5.96	124		128	6.58
5.92	109	103	109	6.64
5.86	92		91	72
5.80	79	79	81	78
5.74	69	66	70	87
			67	91
5.70	64		64	97
5.61	54	58	56	7.05
5.56	50	50	49	7.17
5.54	48		47	7.22
5.50	45		45	7.28

λ	λ_2		λ_2'	λ'
5.44	42		42	7.36
40	39		38	7.49
33	30			
27	33			
19	30			
13	28			
09	27			
5.02	25			

[illegible] H_2O [illegible] 400μ [illegible]

[illegible] Rubens [illegible]

A. Eucken VDPhG. 15, 1159, 1913 ((Dieselbe in Valentiner!

Energie pro Freiheitsgrad $nh\nu$ + $\nu = \frac{nh}{4\pi^2 J}$

... H_2O : 2 ... J ... asymmetrisch H_2O Molekül + 2 Serien

1). dieselbe wie ... nur dass $J = 0.96 \cdot 10^{-40}$ genommen wird, ... bis $n=1$

2). $J = 2.21 \cdot 10^{-40}$ ... 16 bis $n=1$

Ev. Bahr 15, 1150, 1913

Abs. ... HCl ... 3.5μ ... 12 Maxima

$\lambda_0 = 3.474\mu$ $\nu_0 = 8.636 \cdot 10^{13}$

n	λ_1	λ_2	$(\nu_1-\nu_0)10^{-11}$	$(\nu_0-\nu_2)10^{-11}$	$\frac{\nu_2 \cdot 10^{-4}}{n}$	λ_2
	3.444	3.504	7.5	7.4	7.45	403
	3.416	28	14.6	13.3	6.98	215
	394	56	20.3	20.0	6.72	149
	72	83	26.1	26.3	6.55	115
	52	3.610	31.4	32.6	6.40	94
	32		36.8		6.13	82
	3.317		40.8		5.83	74

(dies bedeutet ... J ... Rot. ... ν_2

P. Ehrenfest DPhG. 15, 451, 1913 Bemerk. betr. d. sp. Wärme zweiatomiger Gase

alte Formel v. Planck (ohne Nullp. En.) gibt, ... H_2 ... Rechn. ($\epsilon = \frac{J}{2}(2\pi\nu)^2$ ...)

... Einsteins Stern als Argument / Nullpunktsenergie ...

Vors. ... : $\epsilon_n = \frac{J}{2}(2\pi\nu)^2 = n\frac{h\nu}{2}$ / wie Eucken oben! / ... nur die diskreten Werte ... zugelassen

Dann ist Rot. Energie $= N \frac{\sum \epsilon_n e^{-\frac{\epsilon_n}{kT}}}{\sum e^{-\frac{\epsilon_n}{kT}}}$ $\epsilon_n = n^2 \frac{h^2}{8\pi^2 J}$

Darin der Unterschied gegen Planck'schen Formel dass $\epsilon \sim n^2$ ... falsch!

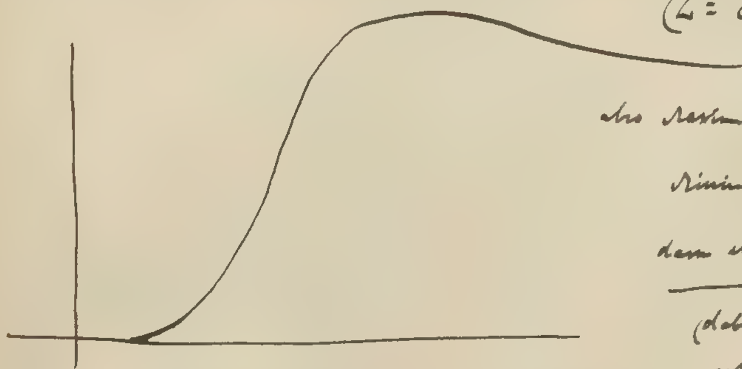
Es folgt für Komplex pro Mol $\frac{\partial E_x}{\partial T}$

$$c_x = Nk\sigma^2 \frac{d^2}{d\sigma^2} \log \varphi(\sigma) \qquad \sigma = \frac{h^2}{8\pi^2 \mathfrak{I} kT}$$

$$\varphi(\sigma) = 1 + e^{-\sigma} + e^{-4\sigma} + e^{-9\sigma} + \dots$$

Die einzige verfügbare Konstante $\sigma T = \frac{h^2}{8\pi^2 \mathfrak{I} k} = 570$ gesetzt:

($\mathfrak{I} = 0.69 \cdot 10^{-40}$)



also Maximum. 0.89 Nk für 250° abs.

Minimum 0.76 Nk 550°

dann erst asymptotisch bis Nk

(dabei ist der Verlauf für sehr niedrige Temp sehr angenähert gleich Einstein)

(Vergl. Bjerrum Zf Elektr. 17, 731, 1911; 18, 101, 1912.)

H Drell u. E. Schenkl d. Prinzip v. Hamilton u. Maupertuis

beweisen daß Hamilton'sche Prinzip mit Prinzip d. kleinsten Aktion nicht wesentlich sondern nur formal verschieden ist.

Dagegen ist Hölder's Form nicht äquivalent mit D'Alembert

Voss' Form (allgemeinste [illegible]) ist d. Prinzip d. Hamilton nur formal

---

Vd Broek Phil Mag. 25, 740, 1913

Not only quantitative relation between period and velocity (Rutherford) but

$\log V_\alpha = A + nB$ n = number of charges expelled during disintegration

$\log \lambda = C + nD$ B, D general constants

A, C specific for each series

V. d. Broek Phys Z. 13, 32, 1914

Period. System d. Elemente u. Anzahl d. Elektronen

	He	Li	Be	B	C	N	O	F
n =	2	3	4	5	6	7	8	9
	Ne	Na	Mg	Al	Si	P	S	Cl
n =	10	11	12	13	14	15	16	17
	Ar	K	Ca	Sc	Ti			
n =	19	20	21	22	24			
	Kr	Rb	Sr					
n =	42	43	44					
	~~n=92.9~~							
	Xe							
	65							
	n=130.2							

Bohr Ph. M. 26, 497, 1913

n=1 — 1	13 — 8, 2, 3
2 — 2	14 — 8, 2, 4
3 — 2, 1	15 — 8, 4, 3
4 — 2, 2	16 — 8, 4, 2, 2
5 — 2, 3	17 — 8, 4, 4, 1
6 — 2, 4	18 — 8, 8, 2
7 — 4, 3	19 — 8, 8, 2, 1
8 — 4, 2, 2	20 — 8, 8, 2, 2
9 — 4, 4, 1	21 — 8, 8, 2, 3
10 — 8, 2	22 8, 8, 2, 4
11 — 8, 2, 1	23 8, 8, 4, 3
12 — 8, 2, 2	24 8, 8, 4, 2, 2

Sutherland $\eta_\theta = \eta_0 \dfrac{1+\frac{C}{273}}{1+\frac{C}{T}} \sqrt{1+\frac{\theta}{273}}$ Jellinek I, 305

			Chapman p. 476		
He	η = 1891 *	C = 80.3 *	η = 1886	C = 75.3	← mean value (diff. observers)
Ne	2981	56	2981	56	
Ar	2104 *	169.9 *	2107	162	
Kr	2334	188	2334	142 (?)	Rankine
Xe	2107	252	2107	252	Ph. M. 1911 p. 45
Hg	1620				

* Schultze

Wood Proc. Phys. Soc. 1914/ pp. 26 Guthrie Lecture: Radiation of gas molecules excited by light

~~Act~~ Hg - vapour $\lambda = 2536$

scattered light much more homogeneous than primary ; if scattered (~~secondary~~) as source, much more efficient

Na vapour visible, when density increased, all light is concentrated on surface patch

if this patch used as source and focussed by concave mirror on other part of bulb

the brightness of both patches is equal ∴ True absorption does not exist

Absorption only if air or other gas admitted

D_1 and D_2 line emitted independently

but in other cases whole resonance-spectrum

OH Keen & AW Porter Pr.R.S. 89, 370, 1913

Diff. of Light by parts. comparable with wave length

~~###~~ S (Na thiosulphate) + weak acid

after becoming nearly opaque, gets transparent again with excess of blue transmitted

afterwards change of tint from green to white

also ~~##~~ observed in other cases

transmitted intensity $= fn\left(\frac{t}{\lambda}\right)$ now according to Rayleigh's $= fn\left(\frac{\text{diameter}}{\lambda}\right)$

∴ diam. $\sim t$

If instantaneous liberation of HSO_3 :

$$\frac{dx}{dt} = K(a-x)$$

$$x = a(1-\varepsilon^{-Kt}) \quad \therefore \text{linear at } \text{first stage}$$

But probably at least supersaturation, this supersaturated solution diffusing toward particles

amount reaching them $\sim$ area ∴

$$\frac{dx}{dt} = K x^{2/3}(a-x) \quad \therefore \text{ in first stage: } x^{1/3} = t.\text{const} \quad (\text{diam} \propto t) \text{ linear factor}$$

Wenn A glaubt es seien in einer Urne 10 weisse u. 10 schwarze Kugeln so glaubt er mit Wahrsch. $\frac{1}{2}$ auf einen weissen Wurf hoffen zu dürfen. Wenn aber tatsächlich 20 weisse 10 schwarze drin sind, so ist die tatsächliche Wahrscheinl. = $\frac{2}{3}$. Ist letzteres der „Grad der berechtigten Vermutung" nach Meinong? Nein, denn A weiss nicht, dass 20 drin sind, vermutet also nicht $\frac{2}{3}$ sondern $\frac{1}{2}$.!

Übrigens ist das eine Advokaten-Spitzfindigkeit derart zu definieren. Würde man Meinong fragen, wann des Krieges Ende sein wird, würde er antworten: Dann wann wir sein Ende zu erwarten berechtigt sind! Richtig, aber nichtssagend! Leere Definition!

Wahrh. = Eigenschaft von Objektiven { dass Kohlensäure besteht ... „Sein" / dass alle Bewegung relativ ist ... „Sosein" } – Objektive

Objektive haben wohl objekt. wie subjekt. Eigenschaften

Vermutungswahrh. ...... = Wahrh. im engeren Sinn
vermutungsfreie Wahrh. = Möglichkeit } Wahrh. im weiteren Sinne (schwer zu definieren)

Analogie mit Wahrheitsbegriff { Tatsächlichkeit (subjektiv) (analog Wahrh.)
unsubjektiv = Tatsächlichkeit (analog Möglichkeit)

Was ist Möglichkeit?

über Definitionen p 50

freie Defin. { (rundes Viereck)
gebundene entstanden durch { Zusammenfassung gegebener Gegenstand ~~...~~ (vorbereitend)
Leistungen von Vorstellen die Def. geleistet wird (nachbereitend) (Handbuch)

Der Kern der Lehre von d. Definitionen ist also die Relation der Defin. und ihr Verh. zu den Tatsachen

Zunächst vorstellendes Erfassen. (Gerade Linie)

Dem Gegenstand beiderseitig: Konstanz d. Richtg. d. Geraden, ausgezeichnete Stellung etc.

Wenn eines dieser Merkmale als wichtig festgehalten wird, so definiert man: „Gerade ist ...
ohne Rücksicht auf die anderen Merkmale

Dann (unbewusst) Frage ob solche „Gerade" ~~...~~ unwidersprüchlich

Möglichkeit = Negation d. Unmöglichkeit (= Notwendigkeit d. Nichtseins)

Tatsächlichkeit – Möglichkeit – Untatsächlichkeit

p. 3 [illegible] $\frac{1}{6}$ [illegible], [illegible]?

– [illegible] d. bevorstehenden Wurfes bedeutet es jedenfalls nicht, denn [illegible] sind 5 [illegible] als [illegible].

Also kann die „Wahrsch." jenes Wurfes ~~[illegible]~~ nur etwas in uns (als Erwartung) Seiendes bedeuten.
als desjenigen der „vermutet"

Parallelismus zw. d. Vermutungsstärke u. Wahrsch.grad

Doch durchaus nicht Identität derselben (Emotionelle Schwankungen d. Vermutung!)

---

p. 7 objektive Auffassung? Ist Wahrsch. wirklich = Verhältnis $\frac{\text{günst.}}{\text{mögl.}}$ für genau Anzahl v. Fällen?

[illegible] Spezialfall!

[illegible] möglichen Fälle

[illegible] 100 [illegible] 100 [illegible]

[illegible].

Andere Art: Wahrsch. = Quotient
~~[illegible]~~ bei uns Laplace gemeint (Essai phil. sur les probabilités 1814 p. 7): doch: Le rapport de ce nombre à celui de tous les cas possibles est la mesure de cette probabilité, qui n'est ainsi qu'une fraction dont le numérateur est le nombre des cas favorables et dont le

Analoge Definition wie Geschw. = $\frac{\text{Weg}}{\text{Zeit}}$

Aber wenn hat dieser Quotient die Bedeutung [illegible], Quotienten kann man wohl in
besonders als gleichmäßige Fälle gar nicht anwendbar!

Viel [illegible]. Wie [illegible]? Es ist doch wohl keine willkürliche Definition. Wohl so:

„mathem. Wahrsch." = Zahl welche die Stärke d. Wahrsch. angibt und auf die Bestimmung d. Sinnes der letzteren Kenntnis gerade an.

p. 16 Mängel d. subjektiven Betrachtungsweise werden vermieden wenn man bei Berechtigung d. Vermutung [illegible]

Allerdings gilt das nicht für alle Wahrscheinlichkeitsfälle. Wenn z.B. jemand sagt, beim Würfel ~~[illegible]~~ kommt die Wahrsch. $\frac{2}{3}$ zu, nicht immerhin 2 zu werfen", so ist die subjektiven Bet. ganz [illegible]

Also gibt es zwei verschied. Gedanken, mehr subj. [illegible], die mit Wahrsch. bezeichnet werden.

Meinong

p. 240 zufällig heisst ein tatsächliches Objektiv wenn es nicht notwendig ist

Das Zufällige liegt ... ausserhalb d. Notwendigen; ... das Gebiet d. Untatsächlichen ist nicht minder ausgeschlossen. So muss d. Zufällige eben ein Mögliches sein und d. Möglichkeit macht [illegible] die eine, steigerungsfähige Komponente alles Zufälligen aus.

Nur dürfte man deswegen nicht etwa d. ganze Zufälligkeit in Möglichkeit aufgehen lassen

Steigerungsfähigkeit d. Möglichkeit

p. 716 Zufälligkeit ist eine innere oder bloss äussere, je nachdem die negierte Notwendigkeit eine innere oder äussere ist.

↓ weiter zu ...

[illegible]

[illegible]

§ 40 zahlenmässiger Ausdruck d. Möglichkeit nennt man eigentlich Wahrscheinlichkeit

p. 313 "Gleichmöglichkeit [illegible] „Prinzip d. mangelnden Grundes" [illegible]

[illegible]

§ 50 Vernünftig ist eine Vermutung wenn der Vertatsächlichungsgrad also die Möglichkeit eines Objektivs zur Vermutungsstärke passt.

p. 395 Die [illegible] [illegible]

= Wahrscheinlichkeit [illegible] Möglichkeiten [illegible]

(Parallelismus) [illegible]

622

1). Wieso erhält Planck's Strahlungstheorie ein mit Thermodynamik unverträgliches Resultat falls $\varepsilon \lessgtr h\nu$ obwohl er ~~d~~ scheinbar die Boltzmann'sche Entropie Definition benützt?
Das zeigt doch, dass faktisch Planck nicht die richtige Entropie berechnet?
Sehr richtig bemerkt Langevin (Solvay p. 100) dass Liouville's Satz erfordert dass gleichgrosse Elementargebiete oder [illegible]
genommen werden.

$\pi = \frac{1}{20}$ barye $= \frac{1}{20} \frac{\text{dyn}}{\text{cm}^2}$

$$p = \rho \frac{c^2}{3} = \frac{n\,(mc^2)}{3} = \cancel{\ldots} \quad \Big\} \quad \frac{p}{\pi} = \frac{n}{N} \qquad N = n\,\frac{\pi}{p}$$

$$\pi = \frac{N\,(MC^2)}{3} \qquad = 3 \cdot 10^{19}\ \frac{\frac{1}{20}}{10^6} = \frac{3}{2} \cdot 10^{12}$$

(pro cm^3)

Volum Konzentration: $c = \frac{3}{2} \cdot 10^{12} \cdot \frac{4}{3} a^3 \pi$

$$c = \frac{3}{2} \cdot \cancel{10^{12}}\, \frac{4}{3} \cdot (0{,}33)^3 \cdot \cancel{10^{-12}}\, \pi = 2\pi\,(0{,}33)^3 = 2\pi\ 0{,}33 \cdot 0{,}11$$

$$= 2\pi \cdot 0{,}036$$

$$= 0{,}24$$

~~$N = \frac{3}{2} \cdot 10^{12}$~~

mittl. Abstand: $\cancel{\frac{10^{-4}}{\sqrt[3]{\frac{3}{2}}}} = \frac{1\mu}{\sqrt[3]{\frac{3}{2}}}$

Volum Konz. $\frac{1}{15} = 0{,}067$

$$n = n_0 e^{-\alpha x} \qquad \int_0^\infty n\,dx = \frac{n_0}{\alpha} = N$$

Messung der Zahlen n_0 und N und hieraus Bestimmung von α

Sodann verschiedengrosse N nehmen und dadurch Abweichungen von Boltzmann quantitativ genau messen

$$(n_0) = \int_0^\varepsilon (n_1 + n_2)\,dx = \underline{n_{01}\,(1 - e^{-\alpha_1 \varepsilon}) + n_{02}\,(1 - e^{-\alpha_2 \varepsilon})}$$

$$\int_0^\infty \qquad = n_{01} + n_{02} = N$$

Also im Falle inhomogener Emulsion ist nicht mehr (n_0) proportional mit N

Dafür Temperatursprung!

bei 35 mm Druck: $\lambda = 10^{-5} \cdot 20 = 2 \cdot 10^{-4}$

$$\frac{\Delta\theta}{\lg\frac{A}{a}} \qquad \frac{\Delta\theta}{\lg\frac{A}{a} - \delta\left(\frac{1}{A}+\frac{1}{a}\right)}$$

$$\frac{\delta}{a} : \lg\frac{A}{a} = \frac{3{,}4 \cdot 10^{-4}}{5 \cdot 10^{-3}} : 3 = \frac{0{,}34}{5} : 3$$

$$= 0{,}068 : 3 =$$

$$\underline{\underline{(2{,}3\,\%}}$$

$$\cancel{}\ \overline{x^2} = \xi^2\left(1-e^{-2\beta t}\right) + x_0^2 e^{-2\beta t}$$

$$\overline{x} = x_0 e^{-\beta t}$$

$$\overline{(x-x_0)^2} = \xi^2\left(1-e^{-2\beta t}\right) + x_0^2 e^{-2\beta t} - 2x_0^2 e^{-\beta t} + x_0^2$$

$$\overline{R^2} = \xi^2\left(1-e^{-2\beta t}\right) + x_0^2\left(1-e^{-\beta t}\right)^2 = \cancel{}\ 2\beta t \cdot \xi^2$$

$$\overline{R} = x_0\left(1-e^{-\beta t}\right) \qquad = -\beta t x_0$$

$$f(\varphi) = -x_0\beta$$

$$\frac{\partial W}{\partial x}\frac{\overline{R^2}}{2} + W\left\{f(\varphi)\cdot\tau - \underbrace{\overline{R}}_{x_0\left(1-e^{-\beta t}\right)} + \underbrace{\frac{1}{2}\frac{\partial\overline{R^2}}{\partial x}}_{\cancel{x_0\left(1-e^{-\beta t}\right)^2}}\right\} = 0$$

$$\frac{\partial W}{\partial x}\cdot\beta t\,\xi^2 + W\left\{-x_0\beta\tau - \beta\tau x_0 + 2\beta\tau\,\xi^2\right\} = 0$$

$$\frac{\partial W}{\partial x} + \cancel{W \ldots} + W\cdot\frac{2(\xi - x)}{\xi^2} = 0$$

$$\frac{\partial W}{\partial x_0} = -\frac{\beta}{\cancel{D}}\,\frac{\left(x - x_0 e^{-\beta t}\right)}{1-e^{-2\beta t}}\cdot e^{-\beta t}\cdot e^{\cdots\cdots}$$

Für großes ε:
$$\frac{e^{\varepsilon}-e^{-\varepsilon}}{e^{\varepsilon}+e^{-\varepsilon}} = \frac{1-e^{-2\varepsilon}}{1+e^{-2\varepsilon}} = 1-2e^{-2\varepsilon}$$

Dagegen wird die Elimination der Strahlung mangelhafter sein, da dann

$$\gamma^2 = \frac{2\pi a\, \sigma_{st}}{a^2\pi\, K_1} = \frac{2\sigma}{a K_1} \qquad \sigma = 1{\cdot}3 \cdot 10^{-12}\left[(\theta+273)^4 - \cancel{273^4}\right]$$

$$4 \cdot 273^3 \cdot \theta$$

$$= \frac{2 \cdot 1{\cdot}06 \cdot 10^{-3} \cdot 2}{5 \cdot 10^{-3} \cdot 0{\cdot}17} \qquad = 1{\cdot}058 \cdot 10^{-3}$$

$$\begin{array}{r} 2{\cdot}43616 \\ 7{\cdot}30848 \\ 171600 \\ \hline 9{\cdot}02448 - 12 \end{array}$$

$$= \frac{8{\cdot}48}{1{\cdot}7} = 5$$

im Falle 16% Refl. Verm. $\gamma^2 = 0{\cdot}5$

$$\left.\begin{array}{l} \gamma = 0{\cdot}7 \\ \lambda = 2 \end{array}\right\} \varepsilon_2 = 0{\cdot}7 \qquad \varepsilon_1 = 3{\cdot}5$$

$$\frac{0{\cdot}4343}{0{\cdot}30401} \cdot 0{\cdot}7$$

$2{\cdot}014$

$$\frac{1}{0{\cdot}7}\,\frac{2-\frac{1}{2}}{2+\frac{1}{2}} = \cancel{\ldots} \frac{1}{0{\cdot}7}\cdot\frac{3}{5} = \frac{3}{3{\cdot}5}$$

$$1 - \frac{\cancel{4}\,(1+\varepsilon+\frac{\varepsilon^2}{2}) - (1-\varepsilon+\frac{\varepsilon^2}{2})}{\frac{1}{\varepsilon}\,(\qquad) + (\qquad)} = 1 - \frac{1+\frac{\varepsilon^2}{6}}{1+\frac{\varepsilon^2}{2}} = \frac{\frac{\varepsilon^2}{3}}{1+\frac{\varepsilon^2}{2}}.$$

$\cancel{30}$

Also $\bar\theta = \theta_\infty \cdot \frac{1}{7}$! während für ε_1 annähernd $\bar\theta = \theta_\infty\left(1-\frac{1}{3{\cdot}5}\right)$

Also $\bar\theta_{\text{wirk}} = \theta_\infty\left\{\dfrac{\frac{25}{3{\cdot}5} - \frac{2}{7}}{8}\right\} = \theta_\infty \frac{48}{56} = \frac{6}{7}\theta_\infty$

Also wird die Strahlungscorrection um 1/7 zu niedrig geschätzt, also sind Euckens Zahlen

122 alle etwas $\left(\frac{1}{5}\ \%\right)$ zu erniedrigen

$$\cancel{\bar\theta = \theta_\infty \left\{1 - \frac{a\left(1-\frac{\varepsilon_1}{\gamma}\right) - b\left(1-\frac{\varepsilon_2}{\gamma}\right)}{a-b}\right\}}$$

~~wenn~~ $\cancel{\lambda_1 > \lambda_2}$

$$\cancel{f\left(\frac{\lambda_1}{2}\right) \leq f\left(\frac{\lambda_2}{2}\right)}$$

$$\cancel{e^{\varepsilon_1+\varepsilon_2}} - \cancel{e^{-\varepsilon_1+\varepsilon_2}} + e^{\varepsilon_1-\varepsilon_2} - \cancel{e^{-\varepsilon_1-\varepsilon_2}}$$

$$-\cancel{e^{\varepsilon_1+\varepsilon_2}} + \cancel{e^{-\varepsilon_1+\varepsilon_2}} + e^{\varepsilon_1-\varepsilon_2} + \cancel{e^{-\varepsilon_1-\varepsilon_2}}$$

~~also ist~~

$$\bar\theta = \theta_\infty \left\{ 1 - \frac{\frac{e^{\varepsilon_1}-e^{-\varepsilon_1}}{e^{\varepsilon_1}+e^{-\varepsilon_1}} - \frac{e^{\varepsilon_2}-e^{-\varepsilon_2}}{e^{\varepsilon_2}+e^{-\varepsilon_2}}}{\varepsilon_1-\varepsilon_2} \right\}$$

$\frac{A}{a} = 20 \qquad \lg \frac{A}{a} = 1.303.\ \ 2.302$

```
 1.303
 2606
  391
    3
 3.000
```

$$\gamma^2 = \frac{2\varkappa.\, 0.00006}{\varkappa\left(\frac{5.10^{-3}}{2}\right)^2 .\, 3.017}$$

$$= \frac{8.\ \ 2.10^{-5}}{25.\, 10^{-6}.\, 017} = \frac{16}{\cancel{\ldots}} = \frac{16.4}{17}$$

$64 : 17 = 3.76$

$= \cancel{\ldots}\ 120$

11

$K_1 = 0.17$

$K = 0.00006$

$\gamma = 6.13$

$\lambda_1 = 10 \qquad \lambda_2 = 2$

$\varepsilon_1 = 30.65 \qquad \varepsilon_2 = 6.13$

```
0.4343 . 30.65
   12260
     920
     123
       9
   13.312
```

```
6.13 . 4343
  26058
    434
    131
  2.6623
```

$$\frac{e^{\varepsilon}-e^{-\varepsilon}}{e^{\varepsilon}+e^{-\varepsilon}} = 1 \quad \text{mit sehr grosser Annäherung}$$

also: $\bar\theta = \theta_\infty \left\{1 - \frac{2}{\gamma\lambda}\right\}$

$$\theta_{\text{wahr}} = \cancel{\theta_\infty\left\{1-\frac{2}{\gamma}\right\}}\ \frac{\lambda_1\bar\theta_1 - \lambda_2\bar\theta_2}{\lambda_1-\lambda_2} = \theta_\infty\left\{\frac{\lambda_1 - \frac{2}{\gamma} - \lambda_2 + \frac{2}{\gamma}}{\lambda_1-\lambda_2}\right\} = \theta_\infty$$

Also ist Eucken's Methode ganz richtig insofern

$$\frac{e^{\varepsilon}-e^{-\varepsilon}}{e^{\varepsilon}+e^{-\varepsilon}} = 1$$ gesetzt werden darf, was da mit grosser Annäherung der Fall ist

$$\theta = -\frac{\alpha}{\gamma^2}\left[\frac{e^{\gamma(x-\frac{\lambda}{2})} + e^{-\gamma(x-\frac{\lambda}{2})}}{e^{\gamma\frac{\lambda}{2}} + e^{-\gamma\frac{\lambda}{2}}} - 1\right]$$

$$\int_0^\lambda e^{\gamma x}\,dx = \frac{e^{\gamma x}}{\gamma}\Big|_0^\lambda$$

$$\int e^{-\gamma x}\,dx = \frac{1-e^{-\gamma\lambda}}{\gamma}$$

$$\bar\theta = \frac{1}{\lambda}\int_0^\lambda \theta\,dx = \frac{-\alpha}{\lambda\gamma^2}\left\{\frac{1}{\gamma}\,\frac{e^{\gamma\frac{\lambda}{2}} - e^{-\gamma\frac{\lambda}{2}} + e^{\gamma\frac{\lambda}{2}} - e^{-\gamma\frac{\lambda}{2}}}{e^{\gamma\frac{\lambda}{2}} + e^{-\gamma\frac{\lambda}{2}}} \cancel{\lambda}\right\} + \frac{\alpha}{\gamma^2}$$

$$= \frac{-\alpha}{\gamma^2}\left\{\frac{2}{\gamma\lambda}\,\frac{e^{\gamma\frac{\lambda}{2}} - e^{-\gamma\frac{\lambda}{2}}}{e^{\gamma\frac{\lambda}{2}} + e^{-\gamma\frac{\lambda}{2}}} - 1\right\}$$

Falls keine Ableitung durch die Enden, wäre $\bar\theta_\infty = +\frac{\alpha}{\gamma^2}$

also:

$$\bar\theta = \theta_\infty\left\{1 - \underbrace{\frac{2}{\gamma\lambda}\,\frac{e^{\gamma\frac{\lambda}{2}} - e^{-\gamma\frac{\lambda}{2}}}{e^{\gamma\frac{\lambda}{2}} + e^{-\gamma\frac{\lambda}{2}}}}_{\text{Correctionsglied infolge Enden}}\right\}$$

Dagegen rechnet Eucken folgendermassen: $a = 10$, $b = 2$

$$\bar\theta = \frac{a\,\bar\theta_1 - b\,\bar\theta_2}{a-b} = \theta_\infty\left\{1 - \frac{\lambda_1 f(\gamma\frac{\lambda_1}{2}) - \lambda_2 f(\gamma\frac{\lambda_2}{2})}{\lambda_1 - \lambda_2}\right\}$$

und betrachtet $\bar\theta = \theta_\infty$

was offenbar nur insofern richtig ist, als $f(\gamma\frac{\lambda_1}{2}) = f(\gamma\frac{\lambda_2}{2}) = 1$ oder $= 0$

Näherungsformel für: $\gamma\frac{\lambda}{2} = \varepsilon = \frac{\lambda}{2}\sqrt{\frac{2\pi\kappa}{\rho\kappa_1 \lg\frac{A}{a}}}$

$$f(\varepsilon) = \frac{1}{\varepsilon}\,\frac{e^{\varepsilon} - e^{-\varepsilon}}{e^{\varepsilon} + e^{-\varepsilon}} = \frac{1+\varepsilon+\frac{\varepsilon^2}{2} - (1-\varepsilon+\frac{\varepsilon^2}{2})}{\varepsilon\,(2+\varepsilon^2)} = \frac{2}{2+\varepsilon^2} = 1 - \frac{\varepsilon^2}{2}$$

$$\theta = \frac{e^{\gamma x} - e^{-\gamma x}}{e^{\gamma l} - e^{-\gamma l}}$$

$$\frac{d^2\theta}{dx^2} = \gamma^2\theta + \alpha \qquad \cancel{\frac{d}{dx}\left(\tau \frac{d\theta}{dx} - \theta \frac{d\tau}{dx}\right)} = \tau\alpha$$

$$\cancel{\frac{d^2\tau}{dx^2} = \gamma^2\tau} \qquad \cancel{\frac{\tau \frac{d\theta}{dx} - \theta \frac{d\tau}{dx}}{\tau^2}} = \frac{\alpha}{\tau^2}\int \tau\, dx + \frac{\beta}{\tau^2}$$

$$\cancel{\frac{d}{dx}\left(\frac{\theta}{\tau}\right) = \frac{\alpha}{\tau^2}\int \tau\, dx} + \frac{\beta}{\tau^2}$$

$$\frac{d^2\left(\theta + \frac{\alpha}{\gamma^2}\right)}{dx^2} = \gamma^2\left(\theta + \frac{\alpha}{\gamma^2}\right) \qquad \theta = \tau\alpha \cancel{\int \frac{dx}{\tau^2}\int \tau\, dx + \beta\tau\int \frac{dx}{\tau^2} + \gamma\tau}$$

$$\theta + [\text{illegible}] = A e^{\gamma x} + B e^{-\gamma x} - \frac{\alpha}{\gamma^2}$$

$$0 = A + B - \frac{\alpha}{\gamma^2} = A e^{\gamma\lambda} + B e^{-\gamma\lambda} - \frac{\alpha}{\gamma^2}$$

$$\cancel{\theta = A e^{\gamma x}} \qquad A\left(1 - e^{\gamma\lambda}\right) = -B\left(1 - e^{-\gamma\lambda}\right)$$

$$B = A\,\frac{1 - e^{\gamma\lambda}}{e^{-\gamma\lambda} - 1} = \cancel{A \ldots}$$

$$\theta = A\left\{\frac{e^{-\gamma x}\left(1 - e^{\gamma\lambda}\right) + e^{\gamma x}\left(e^{-\gamma\lambda} - 1\right)}{e^{-\gamma\lambda} - 1}\right\} - \frac{\alpha}{\gamma^2}$$

$$\theta + \frac{\alpha}{\gamma^2} = A \cdot \frac{e^{-\gamma x} - e^{\gamma(\lambda - x)} + e^{\gamma(x - \lambda)} - e^{\gamma x}}{e^{-\gamma\lambda} - 1} \qquad = \frac{e^{\gamma\left(x - \frac{\lambda}{2}\right)} + e^{-\gamma\left(x - \frac{\lambda}{2}\right)}}{e^{-\frac{\gamma\lambda}{2}} + e^{\frac{\gamma\lambda}{2}}}$$

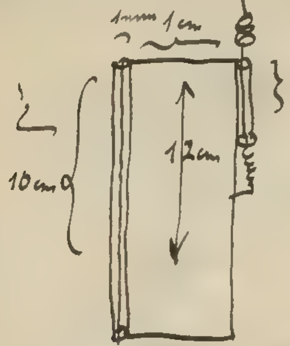
$$\frac{\alpha}{\gamma^2} = A\,\frac{-e^{\gamma\lambda} + e^{-\gamma\lambda}}{e^{-\gamma\lambda} - 1}$$

$$e^{-\frac{\gamma\lambda}{2}}\left(e^{-\frac{\gamma\lambda}{2}} - e^{\frac{\gamma\lambda}{2}}\right) \quad \Big\| \quad e^{\frac{\gamma\lambda}{2}}\left(e^{\frac{\gamma\lambda}{2}} - e^{-\frac{\gamma\lambda}{2}}\right)$$

$$\frac{\theta + \frac{\alpha}{\gamma^2}}{\frac{\alpha}{\gamma^2}} = \frac{e^{\gamma(x-\lambda)} - e^{\gamma(\lambda - x)} - e^{\gamma x} + e^{-\gamma x}}{e^{-\gamma\lambda} - e^{\gamma\lambda}} = \frac{e^{\gamma x}\left(e^{-\gamma\lambda} - 1\right) - e^{-\gamma x}\left(e^{\gamma\lambda} - 1\right)}{\left(e^{-\frac{\gamma\lambda}{2}} + e^{\frac{\gamma\lambda}{2}}\right)\left(e^{-\frac{\gamma\lambda}{2}} - e^{\frac{\gamma\lambda}{2}}\right)}$$

A. Eucken Temperaturabhäng. d. Wärmeleitfähigk. einig. Gase Ph. Z. 12, 1101, 1911

Methode von R. Goldschmidt – Schleiermacher. Ph. Z. 12, 417, 1911



Figur p. 420

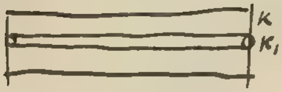
Draht durchm. 0'05 mm

Die 2 Stücke gegengeschaltet = äquivalent mit einem Stück von der Länge 8cm wodurch d. Einfluss d. Ende eliminiert wird

Verdächtig ist Folgendes: Abhäng. von Luftdruck

Luft: Druck	760 mm	1'000
	500	0'999
	210	1'0055
	100	1'013
	40	1'035

wieso ist eine Zunahme möglich bei abnehmendem Druck



$$q\kappa_1 \frac{\partial^2\theta}{\partial x^2} = \frac{2a\pi K}{a}\frac{\theta}{\lg\frac{A}{a}} = \frac{Gi^2}{q} + \alpha$$

~~[illegible]~~

$$\theta = \alpha \lg r + \beta$$

$$\theta_1 = \alpha \lg a + \beta$$

$$\theta_2 = \alpha \lg A + \beta$$

$$\theta_2 - \theta_1 = \alpha \lg \frac{A}{a}$$

$$\theta - \theta_1 = \frac{(\theta_2 - \theta_1)}{\lg\frac{A}{a}} \lg r$$

$$\frac{\partial\theta}{\partial r} = \frac{\theta_2 - \theta_1}{\lg\frac{A}{a}}\,\frac{1}{r}$$

$$\frac{\partial^2\theta}{\partial x^2} = \overbrace{\frac{2\pi K}{q\kappa_1 \lg\frac{A}{a}}}^{=\gamma^2}\cdot\theta + \alpha$$

$$\theta = A e^{\gamma x} + B e^{-\gamma x}$$

$x = 0$ $\theta = 0$ $\quad 0 = A + B$

$$\theta = A(e^{\gamma x} - e^{-\gamma x})$$

$$0 = A(e^{\gamma l} - e^{-\gamma l})$$

$x = l$ $\theta = 0$

2.5.2

$h = \frac{32\pi^3 (n-1)^2}{3 n \lambda^4}$ auf jedes Molekül entfällt : $\frac{32\pi^3(n-1)^2}{3n^2\lambda^4}$.

also kann man vermuten, dass ein entsprechender Lichtdruck ausgeübt wird: $\frac{2}{10}\frac{.42.10^4}{.3.10^{10}}$

Wie verhält sich dies zu der Schwere eines Moleküls? ~~?~~ Stickstoff

$$\delta = \frac{28}{6'06 \cdot 10^{23}}\, g$$

$$= 4'8 \cdot 10^{-20}$$

$$F = \frac{32\pi^3 \cdot (3 \cdot 10^{-4})^2}{3\cdot(3\cdot10^{19})^2 \cdot (0'6 \cdot 10^{-4})^4} = \frac{32 \cdot \pi^3}{3 \cdot 6^4}\,\frac{.10^{-8}}{10^{18}}$$

$$= \frac{3\cdot10^2}{10^3}\cdot 10^{-26} = 3\cdot10^{-27}$$

während Schwarzschild für absorbierende Kügelchen vom Molekulargewicht einen Lichtdruck berechnet hat, welcher ~~die~~ dessen Schwere weit übertrifft! ~~Allerdings kann man sich aber Luftmoleküle nicht als absorb. Kugeln vorstellen, denn Anzahl pro Längeneinheit $\sqrt[3]{3\cdot10^{19}} = 3\cdot10^6$~~

Einfacher so: Atmosphärendruck pro cm^2 = 1 kg = 10^3

Lichtdruck im Falle Spiegels = 10^{-4} falls 10% absorbiert = 10^{-5}

Planck p. 62 ...

unveränderl. Volum $\left\{ V = \int dx\,dy\,dz \text{ const} \right.$ $\qquad \sum f\sigma = \ldots$

,, Gesamt Energie.. $E = \frac{m}{2}\sum(\dot{x}^2+\dot{y}^2+\dot{z}^2) f\sigma = \text{const}$ $\qquad$ Gesamtzahl $\sum f\sigma = \text{const}$

$\delta S = 0$ $\qquad S = \text{const} - k\sum f \log f.\sigma$

$$\therefore \left.\begin{aligned} &\sum(\log f + 1)\,\delta f.\sigma = 0 \\ &\sum \delta f.\sigma = 0 \\ &\sum(\dot{x}^2+\dot{y}^2+\dot{z}^2)\,\delta f.\sigma = 0 \end{aligned}\right\} \therefore \log f + \beta(\dot{x}^2+\dot{y}^2+\dot{z}^2) = \text{const}$$

$$\delta \sum\left[(x_n - x_m)^2 + (y_n - y_m)^2 + (z_n - z_m)^2\right] = 0$$

$$\delta \sum(x_n^2 + y_n^2 + z_n^2) = 0$$

$$\int_0^{\pi}(r^2 + R^2 - 2rR\cos\varphi)\, 2\pi r^2 \sin\varphi\, d\varphi = -(r^2+R^2)\, 4\pi r^2 dr$$

$$\delta\iint (4\pi)^2 r^2 dr\,(r^2+R^2) f(r)\, R^2 dR\, f(R) = 0 \qquad \underbrace{(4\pi)^2\int 2 r^4 f(r)\, R^2 f(R)\, dr\, dR}_{= 2\int r^4 f(r)\, dr \int R^2 f(R)\, dR}$$

$$\delta\int (4\pi) r^4 dr\, f(r) = 0$$

$$\delta\int r^2 dr\, f(r) = 0$$

$$r^2 + \lambda =$$

$$P^2[(n-\nu)^2-n]+P(n+\nu)=\cancel{\#}\,\Delta_n^2 \qquad \xi^2=2P\nu$$

$$\overline{(x-x_0)^2}=\xi^2\left[1-e^{-2\beta t}\right]+x_0^2\left[1-e^{-\beta t}\right]^2 \qquad n-\ldots x_0 \qquad n=x_0+\xi^2$$

$$P$$

$$(1-e^{-\beta t})^2x_0^2-(x_0+\xi^2)(1-e^{-\beta t})^2+\left[1-e^{-\beta t}\right]\left[x_0+\ldots\xi^2\right]$$

$$x_0^2\left[1-e^{-\beta t}\right]^2+x_0\underbrace{\left[1-e^{-\beta t}-(1\mp e^{-\beta t})^2\right]}_{e^{-\beta t}(1-e^{-\beta t})}+\xi^2\left[2-2e^{-\beta t}-(1-e^{-\beta t})^2\right]$$

$$+\xi^2(1-e^{-2\beta t})$$

$$\overline{(n-n_0)^2}=\Delta_n^2 \qquad n-n_0=\overline{\Delta}_n$$

$$\cancel{\overline{\Delta^2_{n-\nu}}=P^2[(n-\nu)^2-n]+P(n+\nu)-2\nu P(n-\nu)+\nu^2}$$

$$\cancel{=\#_{n-\nu}}$$

$$\lim_{P=1}=n^2-2n\nu+\nu^2-n+n+\nu-2\nu n+2\nu^2+\nu^2$$

$$n-\nu=n-n_0+n_0-\nu$$

$$\overline{(n-\nu)^2}=\overline{(n-n_0)^2}+2(n_0-\nu)\,\overline{n-n_0}+(n_0-\nu)^2$$

$$\overline{(n-\nu)^2}=P^2[(n-\nu)^2-n]+P(n+\nu)+2(n-\nu)P(n-\nu)+(n-\nu)^2$$

$$=\left[P^2+2P+1\right](n_0-\nu)^2+P(n_0+\nu)-n_0P^2$$

Juli 7 91:

$$\int_0^\infty e^{-x^2-\frac{a^2}{x^2}}\,dx = \frac{\sqrt{\pi}}{2}\,e^{-2a}$$

$$\int_0^\infty e^{-x^2-\frac{a^2}{x^2}}\sin\frac{b^2}{x^2}\,dx = \frac{\sqrt{\pi}}{2}\,e^{-2c}\sin 2d \qquad c=\frac{\sqrt{2}}{2}\left[a^2+\sqrt{a^4+b^4}\right]^{1/2}$$

$$\int \cdots \cos \cdots = \frac{\sqrt{\pi}}{2}\,e^{-2c}\cos 2d, \qquad d=\frac{\sqrt{2}}{2}\left[-a^2+\sqrt{a^4+b^4}\right]^{1/2}$$

p. 89 $\displaystyle\int_0^\infty e^{-x^2}\sin\frac{b^2}{x^2}\,dx = \frac{\sqrt{\pi}}{2}\,e^{-\frac{b\sqrt{2}}{2}}\sin\frac{b\sqrt{2}}{2}$

$\cdots \cos \quad = \cdots \cos$

p. 82 $\displaystyle\int_0^\infty e^{-a^2x^2}\cos bx\,dx = \frac{\sqrt{\pi}}{2a}\,e^{-\frac{b^2}{4a^2}}$

$$\int e^{ax}\sin bx\,dx = \frac{e^{ax}(a\sin bx - b\cos bx)}{a^2+b^2}$$

$$\int e^{ax}\cos bx\,dx = \frac{e^{ax}(a\cos bx + b\sin bx)}{a^2+b^2}$$

(selbst berechnet)

$$r\int_0^\infty \frac{e^{-\alpha y^2}\cos xy}{r^2+y^2}\,dy = \frac{\sqrt{\pi}}{2}\,e^{r^2\alpha}\left[e^{-rx}\int_{-\infty}^{\frac{x}{2\sqrt{\alpha}}-r\sqrt{\alpha}} e^{-u^2}du + e^{rx}\int_{\frac{x}{2\sqrt{\alpha}}+r\sqrt{\alpha}}^{\infty} e^{-u^2}du\right] = J$$

$$\int_0^\infty \frac{y^2e^{-\alpha y^2}\cos xy}{r^2+y^2}\,dy = \cancel{\frac{\sqrt{\pi}}{\alpha}\,e^{\cdots}}\ \sqrt{\frac{\pi}{\alpha}}\,e^{-\frac{x^2}{4\alpha}} - r\,J$$

$$\int_0^\infty \frac{e^{-\alpha y^2}\,y\sin xy}{r^2+y^2}\,dy = \frac{\sqrt{\pi}}{2}\,e^{r^2\alpha}\left[e^{-rx}\int_{-\infty}^{\frac{x}{2\sqrt{\alpha}}-r\sqrt{\alpha}} e^{-u^2}du - e^{rx}\int_{\frac{x}{2\sqrt{\alpha}}+r\sqrt{\alpha}}^{\infty} e^{-u^2}du\right]$$

9410
II

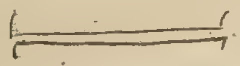
Uzupełn. Perrin, Svedberg, (Mecklenburg Dissert. 1909 Statistik 1910 (Lit. 50)
Rozpr. Smol. w Tomie Witk. Einstein

Fizyka materyi

1). Gazy (tarcie, przewodn. ciepła, dyfuzya)

pompy Gaedego
obrócony rtęciowy
rtęć z rurką

Przy wielkich rozrzedzeniach Knudsen



zamiast prawa Poiseuillea $V = \frac{p_2-p_1}{L}\frac{R^4\pi}{8\mu}$

przychodzi prawo tak zw. Knudsena $V = c\frac{p_2-p_1}{L}\frac{a R^3}{\sqrt{\rho_0}}$

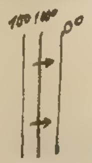
Przy różnicach temperatury powstają różnice ciśnień

$pc = \text{const}$ ciśnienie wzrasta tam gdzie wyższa temperatura pc^2 tak jak $\sqrt{\theta}$

dyfuzya różnych gazów niezależna od siebie każdy gaz

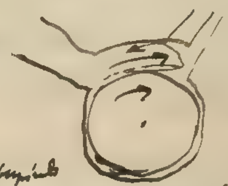
Przewodnictwo ciepła niezal. od grubości warstwy tylko przez ρ

→ absolutny manometr



~~pompa Gaede~~

Molekular luftpumpe



działa dopiero przy rozrzedzeniu tak że przewyższa tylko warstwy λ

200 obrotów / sekundę

krańcowa granica $\frac{1}{20,000\,000}$ mm

kropelki razem jeszcze $\frac{3.10^{19}}{1.5.10^{10}} = 2.10^{9}$ cząst. po cm^3

Lit.
Annalen d. Phys., Dyk Sarth. Lehrbuch
Rozpr. Smol.

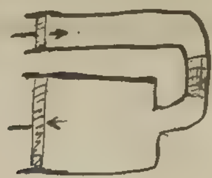
2). Ciecze ? Hydrodynamika powolnego ruchu (Karman, Oseen)

3). Ciała stałe warunki wytrzymałości (Tammann) (Föppl, Voigt, Scott, Smith,

dalej przy cieple

Joule-Kelvin nieodwracalne rozprężenie bez zewn. pracy! tak, że daje zmianę

gaz ... bez pracy i bez przepływu ciepła



$p_1 v_1 = p_2 v_2$

praca nie zależy tylko od stanu początk. i końcowego ale od drogi po której się — ciepło!

przy rozpręż. adiab. z pracą następuje ... ciepło

$$\Delta T = \frac{1}{c_p}\int_{p_1}^{p_2}\left[\vartheta\frac{\partial v}{\partial \vartheta} - v\right]dp = -\frac{p_2-p_1}{c_p}\left(b-\frac{2a}{R\vartheta}\right)$$

punkt inwersji $\vartheta_i = \frac{2a}{bR}$ kryt. temp. $\vartheta_k = \frac{8a}{27bR}$ $\frac{\vartheta_k}{\vartheta_i} = \frac{4}{27} \neq \frac{1}{7}$

H_2 temp. inwersji (Olszewski 1902) $\vartheta_i = -80{\cdot}5$ $= 192{\cdot}5$

(1905) $\vartheta_k = -240{\cdot}8^\circ$ $= 32{\cdot}2$

temp. wrzenia $\vartheta_w = -252{\cdot}6^\circ$

pod 50 mm Hg -259°

zasada stanów odpowiednich

He Kamerlingh Onnes (1905 Olsz. He daremnie)

oznaczenie izoterm

aż do temp. -259°

a, b

temp. inwersji oblicz. $41^\circ = -232^\circ = \vartheta_i$

$\vartheta_k = 6^\circ$ abs. $= -267^\circ$

10/7 1908 udało się skroplenie

$\vartheta_w = 4{\cdot}3$ abs.

pod zmniejszonem ciśnieniem $\vartheta = 1{\cdot}15$ abs.

Želatyny:

conc.	c	Ξ	λ ber	λ zjf	P ber	P zjf
1).	1·76 mm	344	2·21	3·0	25	40 ?
2).	1·30	412	1·85	1·6		
3).	0·53	196	0·78	0·48		
4).	5·42	22	(2·58)	—	35	~~[illegible]~~
5).	1·58	237	1·86	2·2	18	22
6).	3·22	55			27	[illegible]
7).	0·13	13730	0·786	0·626	4·3	6
8).	5·13	33·2	2·74	2·8	41·3	60
9).	0·696	413	7·15	1·06	7·0	7·8

10^{-5}

9.

5 2·3 1·2

10 2·8

10 2·8

(3·2)

10 2·7

c = 76

m = 3·915 8

c = 0·0696

0·5927
1·7502
0·8425 − 2

$\frac{10}{0·28}$ $\frac{7·4}{76.c}$ ‖ 1·9177 − 1 ; − 0·3013 − 2 ; 2·6164

0·4472 − 1
0·8425 − 2
0·0116
0·3013 − 2

E = 413

2·6164
+ 0·5275 − 4
0·1439 − 1
− 2·0878
1·0561 − 4
0·2640 − 1
0·7981
0·0621

λ = ~~2·~~ cm

7·4 : 7 = 1·06 cm / Stund.

λ ber. = 115 cm

P = 76 · $\frac{2}{3}$ $\sqrt{E \lambda^3 \rho}$

0·1439 − 1
1·1335
0·2774
0·1387
0·8808
1·0195

1·045
20·9

P_{ber} = 6·97

P_{gef} 7·8 !

Gelatine über Hg : Spuren von Faltung bei starkem Zusammendrücken sichtbar, aber dann kamen schon seitliche Unregelmässigkeiten und Überdrehung d. Festigkeit.

Grosses Seidenpapier auf Hg. Keine Faltung sichtbar aber bei fortschreitender Bewegung

legte sich in regelmässige Faltung (ca $\frac{1}{2}$–4 mm)

Seidenpapier nass zwischen H_2O und Vaselinöl. Nicht sichtbar, wohl aber Zusammenfalten

so wie vorher bei fortschreitender Bewegung.

Gelatine über Hg stärkere Lösung (ca 2 Blätter auf 3 cm³) und auf erwärmtes Hg gegossen, so dass dünnere Schichte zeigt sehr schöne Faltung

Noch stärkere Lösung (3·5 Blätter) dick 2 mm : 4 Falten

Collodium auf Hg erste zwei Tropfen zerflossen sofort und hinterlassen sehr dünne Membran welche Neigung zu sehr kleinen Faltungen zeigt (λ = ca 0·2 mm)
?

Guttapercha auf H_2O sehr schlechte Faltung $1\frac{1}{2}$ – 2 Falten auf 9·4 cm

auf Hg nur wenn an schwimmende Glasplatte (Unterseite) angeklebt (durch Erwärmen und Paraffin) und dann auch nur undeutlich ca 5 Falten auf 7·5 cm

Schwierigkeit Ränder bei den Glasplatten biegen sich auf

---

anfangs 5 ?
7 Thäler 8 Berge δ = ca $\frac{1}{2}$ mm $\tau = 4 : 6 = \frac{2}{3}$ sec

l = 7 cm

Neue Gelatine Präparate I (auf kalt Hg) 3 Thäler 4 Berge

II („ warm „) 5 „ 6 „

Pergamentpapier
Celluloid

$$\lambda = 2\pi \sqrt[4]{\frac{D}{\rho g}} \qquad P = 2\sqrt{D\rho g} = \frac{\lambda^2}{2\pi^2}\,\rho g$$

$$= 2\pi \sqrt[4]{\frac{E h^3}{12\,\rho g}} \qquad P = 2\sqrt{\frac{E h^3 \rho g}{12}}$$

$$p = \frac{P}{h} = 2\sqrt{\frac{E h \rho g}{12}}$$

Bei Körpern mit geringer Festigkeit (Gelatine) ist die Kleinheit von p wichtig

daher dort ~~[illegible]~~ kleines p anzuwenden

Falls E proport. mit F wächst (an Concentration abhängig) so ist maßgebend

$\frac{p}{F}$ das vorteilhafter grösseres E!

grösseres E kleineres h

Granicznie skrócenie całej długości: $\frac{\delta l}{l} = \frac{P}{E h} = \cancel{2\sqrt{D\rho g}}\; 2\sqrt{\frac{h\,\rho g}{12\,E}}$

zanim wystąpią ~~[illegible]~~ fałdowania

$$\frac{E\,\cancel{h^3}}{\rho g} = \frac{12}{h^3}\left(\frac{\lambda}{2\pi}\right)^4$$

$$= 2\sqrt{\frac{h^4\left(\frac{2\pi}{\lambda}\right)^4}{12^2}} = \frac{2}{12}\left(\frac{2\pi}{\lambda}\right)^2 h^2$$

$$\boxed{\frac{\delta l}{l} = \frac{2}{3}\pi^2\left(\frac{h}{\lambda}\right)^2}$$

Nork na stisi

$F = 50.10^9$

$\rho = 14$

$\lambda = 1$

$\lambda = 2$

$$\lambda = 6\sqrt[4]{\frac{E h^3}{12 \rho g}}$$

$$\frac{5.10^{10} \cdot h^3}{1{\cdot}7.10^5} = \left(\frac{1}{6}\right)^4$$

$$h = \sqrt[3]{\frac{1{\cdot}7.}{5.10^5 . 30.40}}$$

$$= \sqrt[3]{\frac{1{\cdot}7}{6.10^8}} = \sqrt[3]{3.10^{-9}}$$

$$= 1{\cdot}5 . 10^{-3}$$

$$h = \underline{\underline{0{\cdot}015 \text{ mm}}}$$

$$= \frac{1}{70} \text{ mm}$$

$F = 5.g$

$\cancel{a = 8}$

$\cancel{\alpha = \frac{l}{\pi}\sqrt{\frac{8\,\varepsilon}{3}}}$

$\cancel{l = 0{\cdot}5}$

$\cancel{a = \frac{0{\cdot}5}{3}\sqrt{\frac{8\,\frac{1}{10}}{3}}}$

$\cancel{= \frac{0{\cdot}5}{6} = 0{\cdot}1}$

$$f = 2\sqrt{\frac{E h^3}{12}\rho g}$$

$E = 8.10^3$ (CGS)

$\lambda = \frac{1}{5}$ $\quad \lambda = 0{\cdot}5$

$$f = 2\sqrt{\frac{8.10^3 . \cancel{14}}{\cancel{12}}} . 10^3$$

$P = 6.10^3$ CGS $\qquad F = 5.10^3$!

$\frac{P}{k} = 24.g$!

Faltungsdruck zu groß im Vergleich zu Festigkeit

$$\lambda = 2\pi\sqrt[4]{\frac{D}{\rho g}} \qquad D = \left(\frac{\lambda}{2\pi}\right)^4 \rho g$$

$$0{\cdot}8 \; \frac{14.\cancel{10}}{20} g =$$

$$P = \cancel{2} \; 2\left(\frac{\lambda}{2\pi}\right)^2 \rho g$$

$$= \frac{\lambda^2}{2\pi^2}\rho g$$

$Q = \frac{11}{20}\,5 \qquad \frac{5}{5}$

$\cancel{P}$

$\lambda \neq 2\pi \sqrt[4]{\frac{E h^3}{12 \rho g}}$

mědi $E = 1200 \cdot 10^9$

$\rho = 1$

$h = 0{\cdot}02 = 0{\cdot}2$ mm

$\lambda = 6 \sqrt[4]{\frac{10^{12} \cdot 8 \cdot 10^{-6}}{10^4}} = 6\sqrt[4]{8 \cdot 10^2} = \cancel{60 \cdot 180 = 180\ \text{cm}}$!

$= 30$ cm

$E = \frac{h^2}{2} = g$

$E = 8 \cdot 10^3$ (CGS) $= 0{\cdot}8 \cdot 10^5$

$\sqrt[4]{\frac{8 \cdot 10^3 \cdot (\frac{1}{5})^3}{12 \cdot 14 \cdot 10^2}} = 6\sqrt[4]{\frac{8}{2 \cdot 10^4}} = 0{\cdot}6\sqrt[4]{4}$

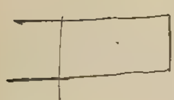
$\lambda = 6$ mm

~~Kautschuk gestört 1 mm~~

Ocelová ohořelá $E = 170 \cdot 10^9$ $h = 0{\cdot}1$ mm $= 10^{-2}$

$\lambda = 6 \sqrt[4]{\frac{1{\cdot}7 \cdot 10^{11} \cdot 10^{-6}}{12 \cdot 10^3}} = 6\sqrt[4]{14} = 12$ cm

$\theta = 2\int_0^{\frac{h}{2}} y^2 dy = \frac{h^3}{4}$



$E\theta \frac{d^2y}{dx^2} = \left(\frac{l-x}{2}\right)^2 h \rho g = \frac{E h^3}{4} \frac{d^2y}{dx^2}$

$R = \frac{dx^2}{dy^2} = \frac{E h^2}{2 \rho g}$

v odstupu $l-x = 1$ cm

$h = \sqrt[3]{\frac{12 \rho g}{E}\left(\frac{\lambda}{2\pi}\right)^4}$ $h = \sqrt[3]{\frac{12 \cdot 10^3}{1400 \cdot 1200 \cdot 10^9}}$ $\lambda = 1$ cm

$= \sqrt[3]{\frac{1}{1{\cdot}4 \cdot 10^{11}}} = \frac{10^{-3}}{\sqrt[3]{140}} = \frac{1}{500}$ mm

$\frac{E\theta}{R} = P = \rho g$ $(l-x) = 1$ cm

$= \frac{E h^3}{4R}$

$\frac{E h^3}{g} = 4R\rho$

Kautschuk $E = 0{\cdot}01 \cdot 10^9$ $h = 0{\cdot}1 = 1$ mm

$\lambda = 6 \sqrt[4]{\frac{10^7 \cdot 10^{-3}}{12 \cdot 10^3}} \neq \cancel{6\sqrt[4]{}} = 6$ cm

Jiná cesta $\lambda = 1$ cm

$h = \sqrt[3]{\cdots} = \frac{1}{6}$

$\frac{4R\rho}{12} = \frac{1}{6^4}$

$R = \frac{3}{6^4 \rho} = \frac{1}{2 \cdot 216 \cdot \rho} + \frac{1}{500} \frac{1}{\rho}$

2 mg $R = 1$ cm

$h = \frac{1}{2}$ mm $\lambda = 6\sqrt[4]{\frac{1}{8}} = 3{\cdot}5$ cm

N° 12 (6)

38	4'2		13		
0			5	2'6	0'40
10	5'5				
			4	2'3	1'24
15	4'0		10		
0	0'7		1	2'4	
23				4'5	2'1
0	4'1		1	2'4	2'8
			20	5'2	
1	2'0			2'4	
0	1'8		10	2'0	1'4
50	5'7	5'7		5'2	2'8
0	2'0				
10	4'1		1	2'5	
1	2'0		10	6'6	4'1
10	7'8				
0	2'9		1	2'5	

1 2'4

1'26

54

1 3'7

1 2'9

$70'5$

0

$\delta_1 - \delta_3 \cdot \frac{97}{...} \cdot \frac{...}{30'5}$

$l = 7{\cdot}66$

N^o (1)

$12{\cdot}35 : \quad \frac{7{\cdot}4 \cdot \cancel{73}}{4} =$

$\cancel{222 : 4}$

$111 : 2 = 55{\cdot}5 \qquad 0{\cdot}9 : 7 = 0{\cdot}13$

$12{\cdot}35 = 55{\cdot}6$

δ direkt gemessen

$\frac{\delta l}{l} = \frac{P}{q\,E}$

$E = \frac{P}{q}\,\frac{l}{\delta l}$

9916
-7451
$0{\cdot}2465 - 1$

$\delta = 0{\cdot}176$ cm

$= \frac{30}{0{\cdot}176 \cdot 7{\cdot}5} \qquad \frac{7{\cdot}5}{0{\cdot}41}\left(\frac{115 \cdot 70{\cdot}5}{99^2}\right) g \;(CGS)$

$1607 \quad 115$
$8482 \quad 70{\cdot}5$
9089
$9912 \quad -99^2$
9177
$4771 \quad 30$
3948
-8583
5365

2455
6128
8583

$E = 344 \cdot g \;(CGS)$

$\lambda = 2\pi \sqrt[4]{\frac{E h^3}{9 \cdot 13{\cdot}6 \cdot g}}$

$122{\cdot}4$

$2{\cdot}5365$
$0{\cdot}7395 - 3$
$0{\cdot}2760$
$-2{\cdot}0878$
$0{\cdot}1882 - 2$

$\frac{2{\cdot}1882 - 4}{4} =$

$0{\cdot}54705 - 1$
3010
4971
$0{\cdot}3452$

berechnet

$\lambda = 2{\cdot}21$ cm

gefunden

$7{\cdot}4 : 2\tfrac{1}{2} = 14{\cdot}8 : 5 = 3$ cm

$\lambda = 2\pi \sqrt[4]{\frac{P \quad a \quad c^3}{b\,c \quad \Delta \quad 9 \cdot 13{\cdot}6}}$

Faltungsdruck

$P = 2\sqrt{\frac{E h^3 \rho g}{9}} = \frac{2}{3}g\sqrt{344 \cdot 13{\cdot}6 \cdot (0{\cdot}176)^3}$

$0{\cdot}2760$
$1{\cdot}1335$
$1{\cdot}4095$
$0{\cdot}70475$

$\frac{5{\cdot}07 \cdot \frac{2}{3}}{0{\cdot}14}$

$P = 3{\cdot}38$ g pro cm

also im Ganzen

$3{\cdot}38 \cdot 7{\cdot}5 = 25$ g

stimmt ungefähr

№(2)

$\frac{6.91}{(7.3)^2}$ 8395 −7266 1129 −1

c = 0·130 m

$\lambda = 2\pi \sqrt[4]{\frac{20.75.\ c^2}{\cancel{7.3}\ 3.1 - 9.\ 13.6} \cdot \left(\frac{115.705}{55^2}\right)}$

3·2 3·2

$\frac{3.1}{20}$

7·3 : 4·5 = $\frac{1.6}{Jf.}$

0·9177
0·2258 −2
1·3010
0·4445
−2·5663
1·8782 −4

1·1335 156
0·9542 p
0·4786
2·5663

0·2195 −1
0·7981 2π
0·0176

0·4695 −1
0·7981
0·2676
λ = 185 ber

~~0·4445~~ 0·9177
4914 1·3010
1129 −1 2·2187
6043 −1 0·6043 −1
2·6144

E = 412 g

0·9177 5185
0·7634 1261
1·6811 7249 −2
−0·3895 −1 0·3895 −1
2·2916

№(3) 6

14 − 12

c = 3345 6096 1·7249 − 2

c = 0·053

E = 196 g

7·0

$\frac{5.8}{12}$ =

$\sqrt[4]{\frac{5.\ 5.8}{3.3\ .\ 7.0}}$ $\frac{c^2}{9.13.6}$ ...

$\frac{0.9}{2}$ = 0·45

$\frac{2.6}{4}$ = 0·65

$\frac{3.3}{5}$ = 0·66

0·9177
1·4498 −4
0·7634
0·1309 −1
+2·7523
0·3786 −4

2·0877
0·5185
0·1461
2·7523

0·0946 −1
0·7981
0·8927 −1

λ = 0·781 cm ber
λ = 0·48 cm Jf.

z reguły występuje tylko wzajemności ilości: [illegible] mniej przy [illegible]

(№25) 1910

5

10

0·35

2·5

20 4·8 4·2

4·6

4·5

0·5

5·6

3·3

3·8 3·1

5·7

4·3

5·7

25 5·5

$\frac{5\cdot6}{25} = \frac{4\cdot4}{20}$

$c = \frac{9\cdot27}{77\cdot76}$ $\quad$ 9671 − 7673 = 1998

$= 0\cdot1584$

$\frac{27\cdot21}{9\cdot27}$

$E = \frac{25}{0\cdot56}\left(\frac{115}{\cdots}\right)\frac{7\cdot7}{7\cdot6}$

9177
1·7979
0057
2·3213
9480 −1
2·3733

7482
1998 −1

E = 2378

$\lambda = \frac{2\pi}{3}\sqrt[4]{\frac{E\,c^3}{9\cdot8\; 13\cdot6}}$

2·3733
+ 0·5994 −3
2·9727 −1
− 1·1335
2·8392 −4
− 9·5142
0·4098 −1
1·8850 −4
0·47125 −1
0·7981
0·26935

7·7 : 3·5 = 2·2

$\lambda =$ ~~186~~ 186 ber

$P = \frac{2}{3}\frac{1}{g}\sqrt{E\,13\cdot6\,c^3}$

2·3733
1·1335
0·5994 −3
4·1062
0·5531
+ 8·808

$\frac{2}{3}\cdot27\cdot2 = 18\cdot1$

P = 14339

19/10

(№ 6)

bei starker Deformation

Fließgrenze

$\lambda = $ 0·7409 − 1
0·5228 − 2
0·2607 − 1

1335 | 2·08777
0542 | 1·1760 − 4

0·2940 − 1 15 18·5

7981
0·0921

4·7
3·1
1·6

~~25~~

0·3421 16

$\lambda = 2{\cdot}2$ cm

E = 9177
1·9010
2·2187

16·9 / 20 = 1·6 / 2

0054
1·2279
0·5076 − 1
1·7409

E = 55

$P = \frac{2}{3} . 8'' \sqrt{E . 13{\cdot}6 . c^3}$

= 1·7409
1·1335
0·5228 − 2
0·8972
0·1986
0·9085
1·0071

n = 21·87 − 21·02 = 20·85

1·3192 − 8116 = 0·5076 − 1

c = 0·322

~~12·8~~

$\frac{405 . \frac{2}{3}}{815}$

P = 26·8 g.

Celloidumkarte 30 mm 13–14 Falt

21/10 Żelatyna czarna mocna

#10

(№ 7)

7·2

1	0·2
6	1·8
	– 1·1
	0·4
3	0·6
4	0·4
5	0·5
	0·4
11	0·8
	0·2
1	
1	– 0·0
	1·4
2	
	3·3
31	0·1
	1·8
	0·4
	0·2
	2·5 –
	3·0

$m = 0·71$

$c = \frac{0·71}{7·2·76}$

8808
60
– 8868
0·1132 – 2

$c = 0·013$ cm

$E = \frac{0·9177-1 \quad 0·3424-1}{1·0990 \quad 0·1132-2}$

0·0235

1·6167

0·4791 – 3

4·1376

41376
0·3396 – 6
0·4772 – 2
– 2·0877
0·3895 – 4
~~0·0774 – 1~~
~~+ 0·7981~~
~~0·8955 – 1~~

$\frac{50}{0·22}$

$E = \underline{13730\,g}$

berb. $7·2 : 11·5 = \underline{\underline{0·626}}$

$\lambda = \underline{\underline{0·786}}$ ber.

8573
0607
7966

$\cap = \frac{2}{3}\sqrt{Eh^3\rho}$

Skrutyna $\rho = 1·24$
Żelatyna ?

41376
0·3396 – 6
1·1335
0·6107 – 1

080535

0·39
2·19

$= \boxed{4·26\,g}$

$\frac{2·0}{50} = \frac{1·6}{30}$

$$y = a\sqrt{1-\cos\varphi} = a\sqrt{1-\frac{dx}{ds}}$$

[illegible]!

$$1-\left(\frac{y}{a}\right)^2 = \frac{1}{1+\left(\frac{dy}{dx}\right)^2}$$

$$1+\left(\frac{dy}{dx}\right)^2 = \left[\frac{1}{1-\left(\frac{y}{a}\right)^2}\right]^2$$

$$\frac{dy}{dx} = \sqrt{\left[\frac{1}{1-\left(\frac{y}{a}\right)^2}\right]^2-1}$$

[illegible] y:

$$= \sqrt{\frac{1-\left(1-2\frac{y^2}{a^2}+\frac{y^4}{a^4}\right)}{1-\left(\frac{y}{a}\right)^2}}$$

$$\neq \sqrt{2}\,\frac{y}{a}$$

$$\cancel{y = p x^2 = \frac{x^2}{a\sqrt{2}}}$$

$$\cancel{\frac{dy}{dx} = 2px \qquad p = \frac{1}{a\sqrt{2}}}$$

$$y = C e^{\frac{\sqrt{2}}{a}x}$$

[illegible] 1 cm: $y_1 = y_0\, e^{-\frac{\sqrt{2}}{a}}$

$$y \quad \sqrt{50} = 7 \qquad e^{-\frac{1.4}{7}} = e^{-0.2}$$

Nr(4)

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
5	[illegible]
[illegible]	[illegible]
10	8·5
[illegible]	[illegible]
10	15·0
[illegible]	1·2
20	15
[illegible]	[illegible]
10	[illegible]
0	[illegible]

$$\begin{array}{r} \cdot\,\cdot\,\cdot\,35 \\ 21\cdot\ 02 \\ \hline m = 31\cdot 33\ g \end{array}$$

$$c = \frac{31\cdot 33}{(7\cdot 6)^2} = 5\cdot 42\ \text{mm}$$

$$\begin{array}{r} 1\cdot 7959 \\ -1\cdot 7616 \\ \hline 0\cdot 7343-1 \end{array}$$

$$E = \frac{20\ \cancel{7\cdot 6}}{\cancel{7\cdot 6}.\ c\ .\ 1\cdot 39} - \left(\frac{115.\ 705}{pp^2}\right)$$

$$\begin{array}{r} = 9177 \\ 3010 \\ \hline 1\cdot 2187 \\ 0\cdot 8773-1 \\ \hline 1\cdot 3414 \end{array}$$

$$\begin{array}{r} 1430 \\ 7343-1 \\ \hline \end{array}$$

$$E = 21\cdot 95\ g$$

$P = 20$

$l = 1\cdot 39$

$$\lambda = 2\pi \sqrt[4]{\frac{E\, l^3}{122\cdot 4\ g}} = 2\pi \sqrt[4]{\frac{21\cdot 95\ .\ c^3}{122\cdot 4}}$$

$$\begin{array}{r} 0\cdot 2029-1 \\ 1\cdot 3414 \\ \hline 0\cdot 5443 \\ -\ 2\cdot 0878 \\ \hline 2\cdot 4565-4 \\ 0\cdot 6141-1 \\ +\ 3010 \\ 4971 \\ \hline 0\cdot 4122 \end{array}$$

$\lambda = 2\cdot 58$ cm

Faltung wurde nicht beobachtet, beim großen Druck zerbrach die Platte ~~in~~ an einem Rande

$$P = \frac{2}{3}\sqrt{\frac{E\,l^3\,\rho g}{\Xi}} = \frac{2}{3}\sqrt{22.\ c^3.\ 13\cdot 6}$$

$$\begin{array}{r} 0\cdot 5443 \\ +\ 1\cdot 1335 \\ \hline 1\cdot 6778 \\ 0\cdot 8389 \end{array}$$

$\frac{2}{3}.\ 6\cdot 90$

$= 4\cdot 6\ g$ pro cm Länge also im Ganzen

$$\begin{array}{r} 4\cdot 6.\ 7\cdot 6 \\ 32\cdot 2 \\ 2\cdot 76 \\ \hline 35\ g \end{array}$$

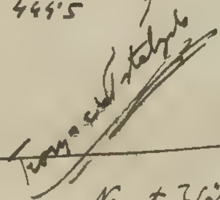
wysokie temperatury oznaczenie punktów stałych (termometr gazowy $Pt\,Rh$, N_2)

(Jena) (Washington)

Holborn, Valentiner, Day, Burgess, Sosman

Wo	3000	±100°
~~Pt~~ Pt	1755	±20°
Pd	1550	15
Au	1063	3°
Ag	961	2°
Al	658	1°
Pb	327·4	±0·4°
Sn	231·9	

punkt wrzenia siarki 444·5



$\lim c_p = 0$

$= \int \frac{C_p\, d\theta}{\theta} = 0$

$= \int \frac{\delta Q}{\theta}$

Nernst Wärmetheorem

$\lim_0 = 0$

$\cancel{\frac{dA}{dT}} = 0$

Prawo Dulong Petit 1818

Djament

Al, Ag, Pb, Cu, Hg, Zn, J

Quarz $A = 22·7$

NaCl

KCl

KBr otóż dyament wykonuje wyjątek

~~np~~ np. Cu: $c = 0·2$ (dla H_2 oziębia)

Einstein (1907)

$$c = 6 \cdot \frac{e^{\frac{\beta\nu}{\theta}}\left(\frac{\beta\nu}{\theta}\right)^2}{\left[e^{\frac{\beta\nu}{\theta}}-1\right]^2}$$

$\beta = \frac{h}{k}$

Lindemann $+ \ldots \frac{\beta\nu}{2\theta} \ldots$

Nernst

Ściśnienie tak samo też rozszerzalność termiczna i ściśliwość

§ punkty topliwości

[Eucken]

Przewodnictwo cieplne kryształów wzrasta z obniżeniem temperat. [diamant, NaCl, ~~...~~, KCl, fluoryt, kwarc, ~~...~~ szkło, S., Parafina, ebonit]

bezpostaci maleje

~~...~~ opór elektryczny metali kolosalnie

Kam. Onnes, Nernst

Rtęć 193 ohmów przy 0°

4'3 abs. 0'084

3 ~~...~~ < 3.10^{-6}

Eucken ciepło właściwe wodoru

Literatura: Jäckel [Lehrb. d. Thermodynamik u. Thermochemie Springer, Berlin 12 mk.] 1912

Nernst Lehrb. d. Chemie nowe wydanie 1912

(Ztsch. U.)

Elektryczność

Clausius Lehre d. Elektr.

Graetz

Witkowski

Mie Lehrb. d. Elektr. u. Magnet.

Teorya Maxwella → Elektrony

1). Rozładowania w gazach Maxwell już przewidział że ..
ale dopiero gdy teorya elektron.

Millikan e

Thomson + ...

Doppler-Kanalstr.

$$u = \frac{2}{9}\frac{a^2 \rho g}{\mu}$$

$$eX = \frac{4}{3}\pi a^3 \rho g$$

2). ~~...~~ Teorya magnetyzmu

Tolloczko Co to są elektrony

3). Promieniotwórczość

Bruner Ewolucya materyi

F. Poske. Didaktik d. Physikal. Unterrichts. Teubner, Leipzig, 1915. Str. X + 428. Cena opr. m. 12.-

Pod względem gruntowności i szczegółowości opracowania przedmiotu jedyne tego rodzaju dzieło.

W części I autor rozstrząsa zadania i metody fizyki oraz zastanawia się nad ogólną dydaktyką tego przedmiotu, porównując zdania różnych autorów i podkreślając dodając bardzo ciekawie własne swoje zdanie. W części II i III autor przechodzi kolejno wszystkie działy fizyki ~~różni się od Grimsehla~~ i rozstrząsa szczegółowo metody traktowania przedmiotu w szkole, uwzględniając różnych rodzajów doświadczeń szkolnych co do ich celowości w nauczaniu, tak dla stopnia niższego jako i wyższego szkoły średniej (z niezbyt wielkim uwzględnieniem gimnazjów), a podając przykład lekcji — w pewnych (?) będzie wykładana w formie dialogu. Tym kwestjom trzy czwarte części dzieła są poświęcone i obszernością tego działu różni się ono głównie od książki Grimsehla, gdzie te sprawy są załatwione na 20 stronach. W szczegółach zdanie referenta jest często po stronie Grimsehla, nie zaś Poskego, który w ogóle przychyla się w wyższym stopniu (niż inni autorzy) do konwencjonalnego sposobu traktowania mechaniki i podobnych spraw. Czwarta (IV) część zawiera krótkie uwagi co do programów nauczania w różnych szkołach, dołączona jest bibliografja dydaktyki fizyki.

W każdym razie, pominąwszy zdania w kwestjach specjalnych mogące być podzielone, a według zdania referenta, należałoby koniecznie więcej jeszcze podkreślić ćwiczenia uczniowskie w organizowaniu własnym z wykładem, dzieło to polecamy gorąco wszystkim osobom zajmującym się nauczaniem fizyki.

twardy dom

zestawienie zebranie (zbiór wykaz) porównanie

jako będzie jakkolwiek

przyjmując jako przyjmując że.

przyjęte że zgodzić się że

przyjęcie ministerstwa zatwierdzenie ministerjum

odmienny odpowiedni

Verdet [illegible] rok?

czy Ostwald [illegible] [illegible] 1151 str. 7

K.T. Fischer Vorschläge zur ... aus/für Physik Tb 1907 ? p 369

H. Buchholz. Die mech. Pot. [illegible] Figur der Erde (Hohen Geodäsie) [illegible] elast. u. hydrodyn. Potential ([illegible] L. Boltzmann's)

2 Aufl. XXXVIII + 820 Barth 1916 oprawne 30

Dr R 81 Kramsztyk Doświadczenia ... wyd. III 1916 str. 202, 1 rb.

Lorentz Electrons 2 ed. IV + 2/4 1916 10 Mk. Tb.

Ostwald [illegible] [illegible] Wanne 1913 str. 152 1.20

(Encyklopedja nauk przyrodniczych i matematycznych!!

Lorentz Théories statistiques [illegible]